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Green Zia Environmental Excellence Program

Wood Working Shops



*Guidance for improved environmental
performance and pollution prevention in
your wood working business*

Acknowledgements

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The Green Zia Environmental Excellence Program

Guidance materials for wood working shops

Introduction

This packet contains information on how to establish a pollution prevention program specifically for a wood working shop. The packet also contains waste management and regulatory guidance materials to help you assure that you are in compliance with environmental, health and safety regulations. Used together, this program can help you establish a pollution prevention program that will help you meet compliance and reduce waste. Use of the tools from start to finish helps you qualify for the Green Zia Environmental Excellence Program!

The Green Zia Environmental Excellence Program is a voluntary program designed to help New Mexico businesses achieve environmental excellence through pollution prevention programs, based on quality management principles. This program is administered by a partnership of state, local and federal agencies, academia, private industry and environmental advocacy groups. This packet has been specifically developed for a wood working shop and is designed to meet the needs of a small business.

The basic logic of the Green Zia Environmental Excellence Program is:

- Waste or pollution is the result of inefficiency;
- Reducing waste increases profits;
- Waste that is not created cannot pollute.

This guidance has been developed to help your company understand best management practices to help your company comply with environmental, health and safety regulations and to help your company reduce waste and associated liabilities.

It is important to remember that environmental health and safety regulations are triggered by the use of equipment and chemicals. Better use of chemicals, use of safer chemicals and efficient operation of machinery can help reduce your regulatory burden...if you aren't using hazardous materials, then you have fewer regulations to be concerned with!

This program is based on first understanding work process and materials use and then improving work practices to reduce cost, waste and regulatory concerns.

Working through the Green Zia Environmental Excellence Program will result in a system that helps address environmental issues in cost effective ways, based on sound business practices. The system provides a framework for continuous improvement over time and contributes to a thorough understanding of environmental issues in your business.

What is Pollution Prevention?

Simply put, pollution prevention means not creating a waste in the first place. Pollution prevention is achieved by the efficient use of resources, including raw materials, energy, water and even time and distance. The goal is to produce a product or deliver a service as efficiently as possible, with the least amount of wasted materials and the least possible environmental impact.

The bottom line is that pollution prevention or improved efficiency can help businesses save money and help protect the environment at the same time.

What is Environmental Excellence?

Environmental excellence means moving beyond compliance with environmental, health and safety regulations by establishing an environmental management system that incorporates pollution prevention into core business practices.

A prevention-based environmental management system will:

- Help a business identify *all* the environmental compliance and health and safety concerns as well as costs associated with a waste generating process, and
- Use prevention approaches to reduce or eliminate the waste and reduce the associated costs.

In the Green Zia Environmental Excellence Program, attention is focused on the *process* that generates the waste, not the waste. Identifying and implementing process improvements will reduce waste and costs. This is a major shift from the traditional, reactionary approach that concentrates only on managing wastes or pollutants already created to an anticipatory approach that concentrates on prevention of wastes or pollutants to improve environmental and economic performance. This prevention-first environmental management system will identify cost effective ways to achieve "beyond compliance" status, creating a win-win situation between economics and environment.

The Green Zia Tools

The Green Zia Program provides tools to establish a basic prevention-based environmental management system. Management and employees walk through the tools as a team to gain a complete understanding of their operation. Examples have been worked out for the wood working business. We encourage you to customize the examples to your own operations. The packet includes a series of process maps (Tool 1) for some operational areas of the wood working business. Tools 2-6 are also explained and illustrated to help you develop your program. Use of these tools on a regular basis will help your company qualify for the Green Zia Environmental Excellence Program.

Green Zia Tools:

Knowledge of Process

Tool 1: Process Mapping: Illustrates the work steps materials pass through as they are transformed into your final product. Maps allow for the identification of all inputs and outputs such as water, chemicals, electricity or other materials from a process, helping you to understand wastes and their sources. Maps also help you understand regulated activities.

Full Cost Accounting

Tool 2: Activity-Based Costing: Identifies the true costs of wastes or losses and helps participants identify areas to target for pollution prevention, by assigning dollar values to these wastes and losses.

Pinpointing Problems

Tool 3: Root Cause Analysis: Creates a cause and effect diagram to highlight why and where the losses occur in the process. Understanding why and where the loss occurs will help participants focus on specific areas for improvement.

Creative Problem Solving

Tool 4: Brainwriting: Addresses problems by generating as many alternatives as possible to minimize loss.

Prioritization of Options

Tool 5: Bubble-up-bubble-down: Ranks alternatives to determine the optimal solution. Factors such as cost, ease of implementation and effectiveness are considered in evaluating and ranking the alternatives.

Ensuring Success

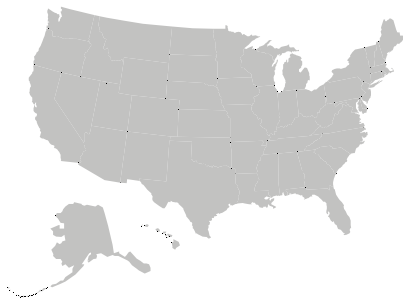
Tool 6: Action Plan: Details each step that needs to be taken to implement the alternative and reduce or eliminate the loss from the process.

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Tool #1: Process Mapping

To begin incorporating pollution prevention into your business, you must first get a full understanding of where wastes are being generated. This tutorial will discuss the advantages of using process maps to logically evaluate each step of your process.

Warm-up Exercise



Maps have been used throughout the ages for many purposes from helping sailors navigate the seas to providing a safe route for climbers hiking to the tallest peaks. You have probably drawn maps to your home or office so that someone could visit. It is important that the information on this map is complete and accurate or, as you may have found, your guest will get lost!

Take a minute now and think of a coffee shop or restaurant nearby that everyone in the group knows. Draw a map from the building you are currently in to this establishment - include traffic lights, landmarks, and any other important features along the way. Now compare maps with the other members of your group. Are they the same? If a person not familiar with the area were to use your map, would they have found their way?

Introduction

Are you aware of the amount of waste that your business generates? Could this waste be turned into profit? By considering methods of reducing wastes, recycling used and unused raw materials, and reusing lost material you could not only help the environment but also reduce your raw material and waste disposal costs.

This section discusses process mapping, a method of analyzing a process in order to catalogue all the materials used and lost in the process. With process mapping, you will systematically identify the series of steps materials pass through as they are transformed into the final product. Evaluating your process in this manner will allow you to recognize the opportunities to prevent losses and possibly streamline operations. Each loss identified during the process mapping is an opportunity to prevent that loss.

Create a team of employees to complete this exercise. During this exercise you will:

- Examine and revise the process maps and narratives in the packet to accurately reflect your operation.
- Fully understand the functionality of each step of a process.
- Identify the inputs and outputs/losses within the process.
- Communicate findings in a clear and concise manner to members of the team.

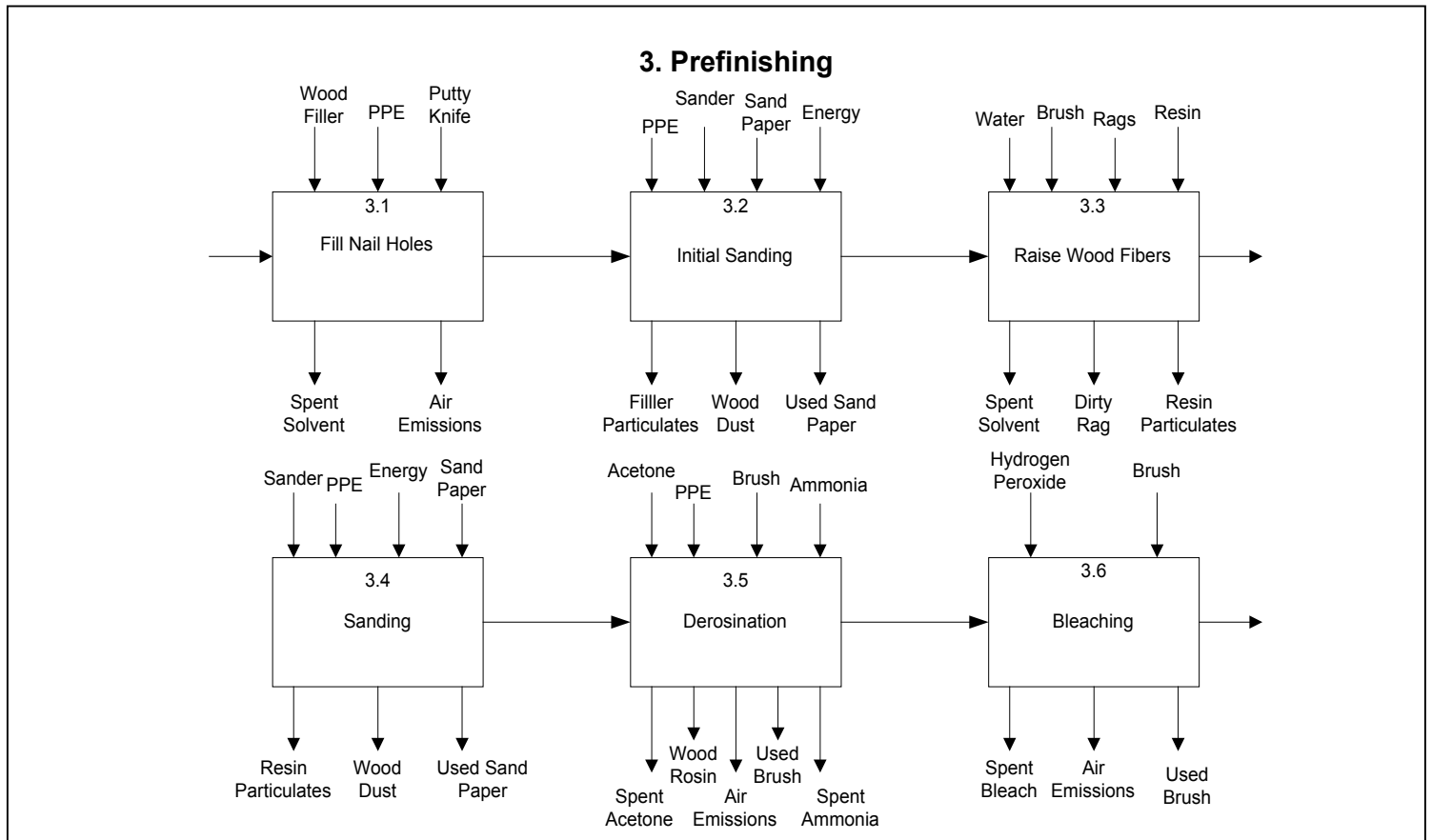
Process Mapping

A series of process maps have been developed for wood working operations and are included in this packet. You should customize these maps for your operation, since no two businesses are exactly alike. These maps become a reference for you to use for your pollution prevention program and can be updated to reflect changes as you improve your operations. These maps are also great for training new employees and other problem solving needs.

Large businesses and manufacturers use these tools to understand and improve their manufacturing processes. Small businesses can benefit by using these tools as well!

It is helpful to also prepare a narrative to go along with your process maps to explain the process in detail. We recommend that you include regulatory activities in the narratives as part of your environmental management system. Narratives are also included in this packet; please revise to reflect your business operations.

Example of a process map for Prefinishing:



Please review the process maps in the back of this booklet and make changes to reflect your operation.

Once you have reviewed and revised the process maps to your operation, move to the next section...Activity-Based Costing!

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Tool #2: Activity-Based Costing

Every waste or environmental loss costs you money. By determining the activities that cause waste, you can focus your pollution prevention efforts to minimize the cost to your business and protect the environment. This tutorial will introduce you to a method of evaluating your waste.

Warm-up Exercise

Your daughter approaches you one evening and says that she is planning to buy a car. With the \$400 she has left over each month, after paying all of her bills, she is sure she will be able to afford the \$220 monthly car payment.



What are the other costs of operating and maintaining a car that she is forgetting? Consider not only the annual costs, such as insurance, but also the intermittent (once in a while) costs. Can she really afford this car?

Introduction

Once you have determined the losses in your processes through your process maps, you can discover how these losses are affecting your "bottom line". How much does it cost you to discard 10% of your raw materials, or 2% of your finished products? Which activities have losses that most hurt the profitability of your company? This tool will help you look at the cost of the losses in your business and see how much these losses are costing you. The results may surprise you!

Which losses should you care about? The Pareto Principle suggests that 80% of the problems in a business come from 20% of machines, raw materials or operators. (The same is true for any facet of a business, for example, 80% of sales come from 20% of your customers, etc.) Once you have assigned costs to your activities, you can figure out which 20% of your activities are contributing to 80% of your costs. The Pareto Principle is very important in activity-based costing as it is used to focus on the most important areas for improvement in your pollution prevention program. Use of the Pareto Principle for the activity-based costing section will help you quickly identify areas of your business to focus your prevention efforts.

New Terms

Activity based costing (ABC) - An accounting method used to assign the cost of your losses to the activities that generate these losses. By assigning costs to activities, you will discover the activities should be targeted for prevention.

Environmental costs - The costs associated with the losses in your process.

Intermittent operations – Operations that occur once in a while.

Pareto principle - A principle that suggests that 80% of anything can be attributed to 20% of the factors involved. For example, 80% of your environmental costs can be attributed to 20% of your activities.

Activity-Based Costing

1. Make a list of all the activities in your operation. Be sure to include the activities from your process map as well as any intermittent operations (such as cleaning or maintaining equipment.).

Regular activities:

- Drying lumber
- Machining lumber
- Pre-Assembling
- Prefinishing
- Applying a coating
- Finishing
- Final assembly

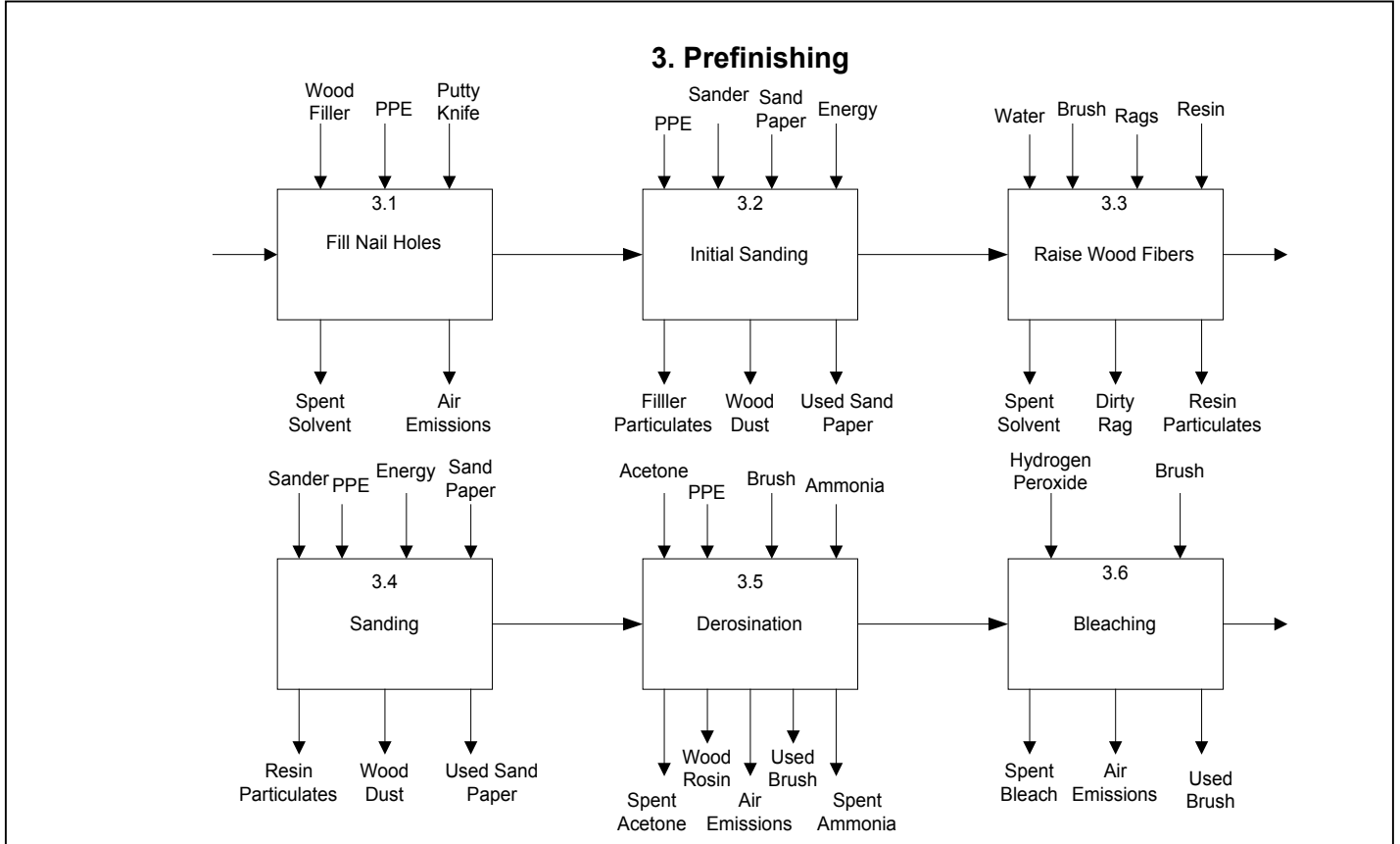
Intermittent activities:

- Compressor maintenance
- Spray gun cleaning

2. List all of the losses in your operation. Look on your process map and add any others that you think of.
3. Reviewing your process maps, identify the operations in your shop that generate most of your waste or pollution problems. For example, does using solvent-based materials for applications and cleaning cause most of your environmental problems? Does the 80/20 Rule apply? Focus your efforts for now on the areas of your operations that you do the most or that create the biggest environmental problem for you.
4. Use process maps to review material use and losses for your selected process or operation...you will use these maps as a guide to assign costs to these losses.
5. Identify which major costs or general ledger costs apply to the material use and losses on the process maps (utilities, chemical purchase costs, waste disposal costs, costs that are easy to get information on and that you typically consider when looking at your processes). Enter into Table 1. (See example provided)
6. Identify which other activities are related to the use of these materials that are not in the major costs (protective equipment such as gloves or, monitoring, record keeping, maintenance, compressors to run equipment, permits, fees to the state or city, storage space for chemicals, the cost of spill clean-up and reporting, etc). These activities are not usually considered when thinking about the cost of a process, yet the costs associated with them can be significant!

7. Write the activities in the first column of Table 2. Along the top list all the costs or services required for these activities. Add or delete categories as appropriate for your business. Put an "x" for every cell that applies.
8. Count the total number of "x's" in Table 2. Then circle the x's that represent what you estimate to be about the top 20% of the most expensive activities in your operation. Again, you are using the 80/20 rule: 20 percent of your activities will probably add up to about 80% of your total costs.
9. Then only estimate the cost of each of these top activities that you circled and write them in a new table. Cost estimates are allowable as you are using this method to prioritize your most expensive activities. You can refine costs once you have chosen a project to work on. (In the example, the top 20% of the cost categories chosen have the estimate beside them.) Add these numbers into Table 1 under the appropriate waste stream in the "Hidden costs" line.
10. Add the ledger costs and the hidden costs together to discover the true costs!
11. Create a Pareto Chart. Create a chart showing all these costs graphically. On the x-axis, place costs in dollars, on the y axis (horizontal), show the true costs of the wastes. This chart will help graphically show how all the costs stack up against each other. Does the 80/20 Rule apply here? Use this chart to identify the most expensive processes. This can be used to identify the first area for improvement! Which waste stream do you think you should focus on from this Pareto chart?

Activity-Based Costing Example



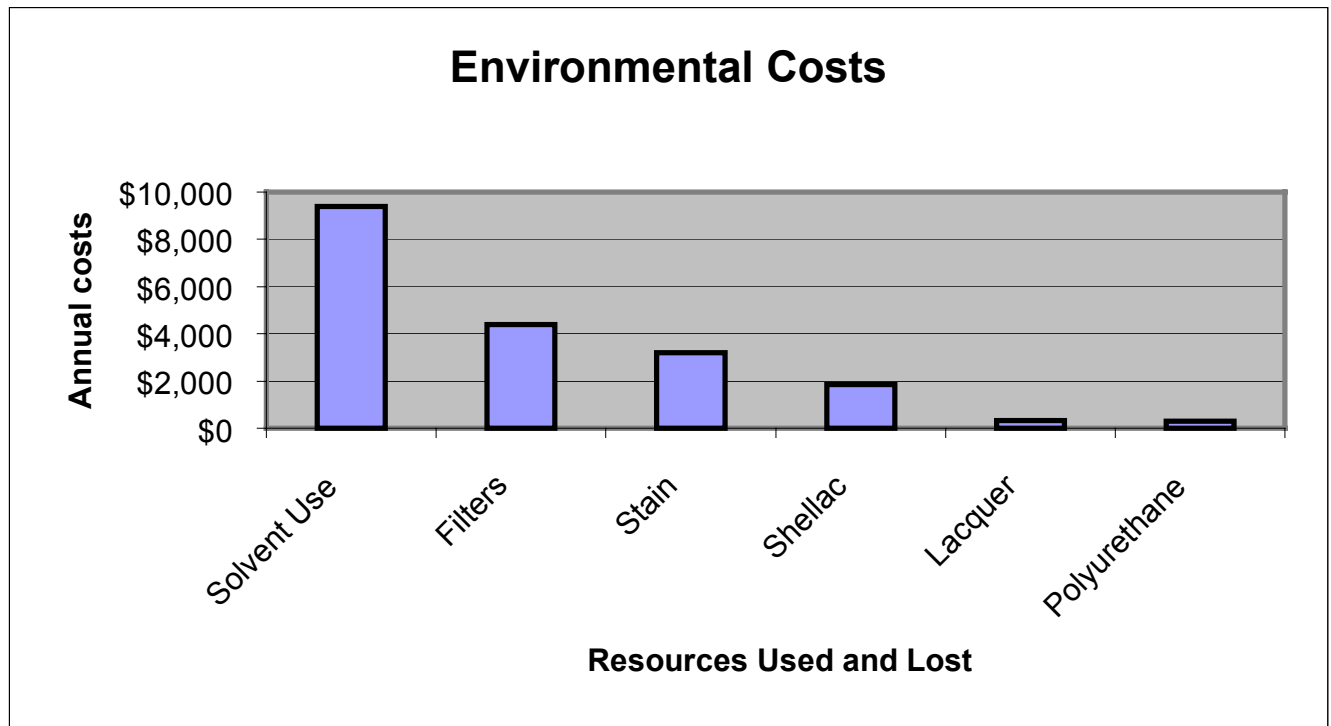
Activities	Materials and Losses
Drying lumber Machining lumber Pre-Assembling Pre-Finishing Applying a coating Finishing Final assembly Compressor maintenance Spray gun cleaning	Energy Adhesives *Solvents Acetone Personal Protection Gear Ammonia Bleach *Filters *Stain *Lacquer *Polyurethane *Shellac (*) Indicates most important waste streams and materials

Table 1. Activity-Based Costing Analysis (Per year)

Workstep							
Costs /Losses	Shellac	Stain	Lacquer	Solvent Use	Filters	Poly-Urethane	Total
Labor	\$650	\$1,300	\$50	\$2,000	\$800	\$100	\$4,900
Raw material	\$1,000	\$1,500	\$75	\$5,000	\$850	\$50	\$8,475
Disposal fees					\$450		\$450
Other ledger costs				\$150			\$150
Hidden Costs	(\$200)	(\$400)	(\$200)	(\$2,250)	(\$2,300)	(\$150)	(\$5,100)
Total	\$1,850	\$3,200	\$325	\$9,400	\$4,400	\$300	\$19,475
%of Total	9.5	16.5	1.7	48.2	22.6	1.5	

Table 2. Hidden Cost Analysis (per year)

Shellac					
Activities/Cost Factors	Materials	Space	Utilities	Services	Labor
Storage	x	X (\$150)	x		x
Recordkeeping				x	X (\$50)
Total hidden costs for shellac					(\$200)
Stain					
Rags Laundry	x	x		X (\$200)	x
Storage	x	X (\$150)	x		x
Recordkeeping				x	X (\$50)
Total hidden costs for stain					(\$400)
Lacquer					
Storage	x	X (\$150)	x		x
Recordkeeping				x	X (\$50)
Total hidden costs for lacquer					(\$200)
Solvent Use					
Recordkeeping				x	X (\$50)
Permit fees	x			x	x
Monitoring	X (\$200)				X (\$800)
Storage	x	X (\$300)	x		x
Reporting	x			x	(\$50)
Rags Laundry	x	x		X (\$400)	
Vent Equip.	x	x	x	x	(\$450)
Total hidden costs for solvent use					(\$2,250)
Filters					
Disposal	x			x	X (\$1,500)
Recordkeeping				x	X (\$50)
Generator Fees					X (\$750)
Total hidden costs for filters					(\$2,300)
Polyurethane					
Storage	x	X (\$100)	x		x
Recordkeeping				x	X (\$50)
Total hidden costs for polyurethane					(\$150)



Pareto Chart for Wood Working Shops: The Pareto Chart illustrates costs relative to each other and helps choose areas to target for pollution prevention activities. In this example, solvent use, the most expensive loss, will be the focus of the pollution prevention efforts in the following sections. Please note that the cost examples provided in this workbook are not from an actual case study but are used only to illustrate the use of the tools.

Now that we have completed the process mapping and activity-based costing, we have a sense of the relative environmental costs of our operations. Since solvent use is our target, we will use the following problem solving and decision-making tools to find a way to reduce solvent use, increase efficiency and save money.

Most of your work is done. These two tools can be revised as needed. Use these maps and information annually (or more often!) to keep improving your operation on an ongoing basis. Now that you have identified your most expensive wastes, you can now move towards solving problems and eliminating waste...the next tool is Root Cause Analysis!

Table 1. Activity-Based Costing Analysis (Per year)

Workstep							
Costs/Losses							Total
Labor							
Raw material							
Disposal fees							
Other ledger costs							
Hidden Costs							
Total							
%of Total							

Table 2. Hidden Cost Analysis (per year)

Activities/Cost Factors	Materials	Space	Utilities	Services	Labor
<i>Waste Stream</i>					
Monitoring					
Reporting					
Rags Laundry					
Disposal					
Vent. Equipt.					
Storage					
Recordkeeping					
Generator fees					
<i>Total hidden costs for (waste stream)</i>					
<i>Waste Stream</i>					
Monitoring					
Reporting					
Rags Laundry					
Disposal					
Vent. Equip.					
Storage					
Recordkeeping					
Generator fees					
<i>Total hidden costs for (waste stream)</i>					
<i>Waste Stream</i>					
Monitoring					
Reporting					
Rags Laundry					
Disposal					
Vent. Equip.					
Storage					
Recordkeeping					
Generator fees					
<i>Total hidden costs for (waste stream)</i>					

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Tool #3: Root Cause Analysis

Now that you have recognized the activities in your process that are costly or expensive to your business, you can begin to focus your efforts on pollution prevention. This tool presents a method of detecting the underlying reason for an environmental loss so that the loss can be prevented.

Warm-up Exercise



Think of all of the times that you have been late for work and list the different reasons for your delay. Maybe your alarm clock did not go off, or perhaps your child was sick and you needed to arrange for a sitter. Did you spend too much time reading the newspaper or did you need to run to the store to pick up milk.

Arrange all these reasons in the categories listed below, or create an additional category. Some of the items on your list may be entered more than once.

Now consider the last time you were late for work. Why were you late? Circle the reason.

MACHINES

broken alarm clock

PEOPLE

sick child

METHODS

reading the newspaper

MATERIALS

out of milk

Introduction

In the last tool you determined the key losses responsible for the greatest amount of environmental costs. In order to try to prevent a loss, you must first understand why it is occurring. The underlying reason for a loss is also known as its "root cause". The root cause will answer the question: What *ultimately* caused the loss? Determining the root cause of an environmental loss is very similar to determining the root cause of being late for work.

A cause and effect diagram is one method of determining the root cause for a loss. This tool provides a visual description of all possible causes for a specific loss. Once all the possible causes are depicted on the diagram, the most plausible cause or causes are identified. It is imperative that all persons involved in determining the root cause are in agreement. The next step is to write a "Dear Abby" letter summarizing the cause or causes for a loss will ensure that all participants see the problem in the same way.

During this exercise you will:

- Construct a cause and effect diagram with all potential causes for a loss.
- Discuss the most probable cause or causes.
- Write a Dear Abby letter describing the reason for the loss.

Root Cause Analysis

After participating in process mapping and activity based costing exercises, it was determined that the largest loss, solvent use, accounts for approximately 80% of all environmental costs in the wood working business. The next step is to discover the root cause of this loss.

To determine the root cause of a loss, you must ask "Why is the loss occurring?" One way of gathering information concerning the generation of a loss is called a cause and effect diagram, or fish bone diagram, since it resembles a fish bone. Major categories of possible causes for the loss are first defined and entered on the diagram as an offshoot from a main horizontal line. Next, all possible causes of the waste are assigned to a category and entered on the diagram. Once all the causes are defined, an agreement is made as to the most plausible reason for the loss.

Divide the causes into four major categories - Methods, Machines, Materials, and People - and then write down all the possible reasons why solvents could be lost from the process and assign them to a category. Begin the diagram and then write down some of the things that immediately come to mind. An example has been provided in Figure 2.

Since solvent use is related to the types of materials used for the finishing operations, the type of spraying operations used to apply the materials, and the requirement to clean to spraying equipment with solvent, several things may come to mind. The present spraying operation uses a high-pressure gun to atomize the material, which is susceptible to overspray, resulting in more finish waste and less transfer efficiency. This also means that the filter in the spray booth will collect more material requiring frequent replacement. Workplace conditions such as poor lighting may lead to poor application of materials to the furniture parts. Training of employees and a good work attitude are critical to efficient operations. All of these ideas should be entered under one of the four categories in the fishbone diagram: Machines, Methods, Materials and People in the example in Figure 2.

Now that all the possible causes of solvent use during wood working operations are categorized, it is time to determine the most probable cause. Go back to the diagram and circle the most probable causes. One of these should be the root cause. Then, working with employees as a team, discuss which one of these major causes is the root cause. To come to clear understanding of the root cause, we suggest that the team write a short “Dear Abby” letter describing their interpretation of the problem to ensure that each person sees the problem the same way. Once the letter is in place, the group becomes Abby and seeks to solve the problem. (see Figure 3)

Another method for determining the root cause of a problem is the “5 whys”.

By asking the question “why?” five times, you may get to the root cause of a problem. An example of how the five whys works is as follows.

The Five Whys:

1. Why has the machine stopped forcing an interruption in production?
A circuit breaker tripped due to an overload.
2. Why was there an overload?
There was not enough lubrication for the bearings.
3. Why was there too little lubrication for the bearings?
The pump was not pumping enough lubrication.
4. Why was there not enough lubricant being pumped?
The pump shaft was vibrating because of abrasion
5. Why was there abrasion?
There was no filter, which allowed chips of metal to get into the pump.

The solution is then to place a filter on the pump to capture metal chips.

Both tools can be used to find the root cause of the problem. For most problems to be permanently solved the root cause must be addressed. The fishbone diagram is a good visual tool that helps you understand all the areas that contribute to a problem. Understanding all the contributing factors will help facilitate problem solving. The Five Whys will also help you move past dealing with the symptoms of the problem to solving the real problem.

Examples of the fishbone diagram and a Dear Abby letter are included as well as a blank fishbone diagram for your use.

The next tool will present brainwriting - a method to generate ideas.

Figure 1: Prefinishing - Process Map

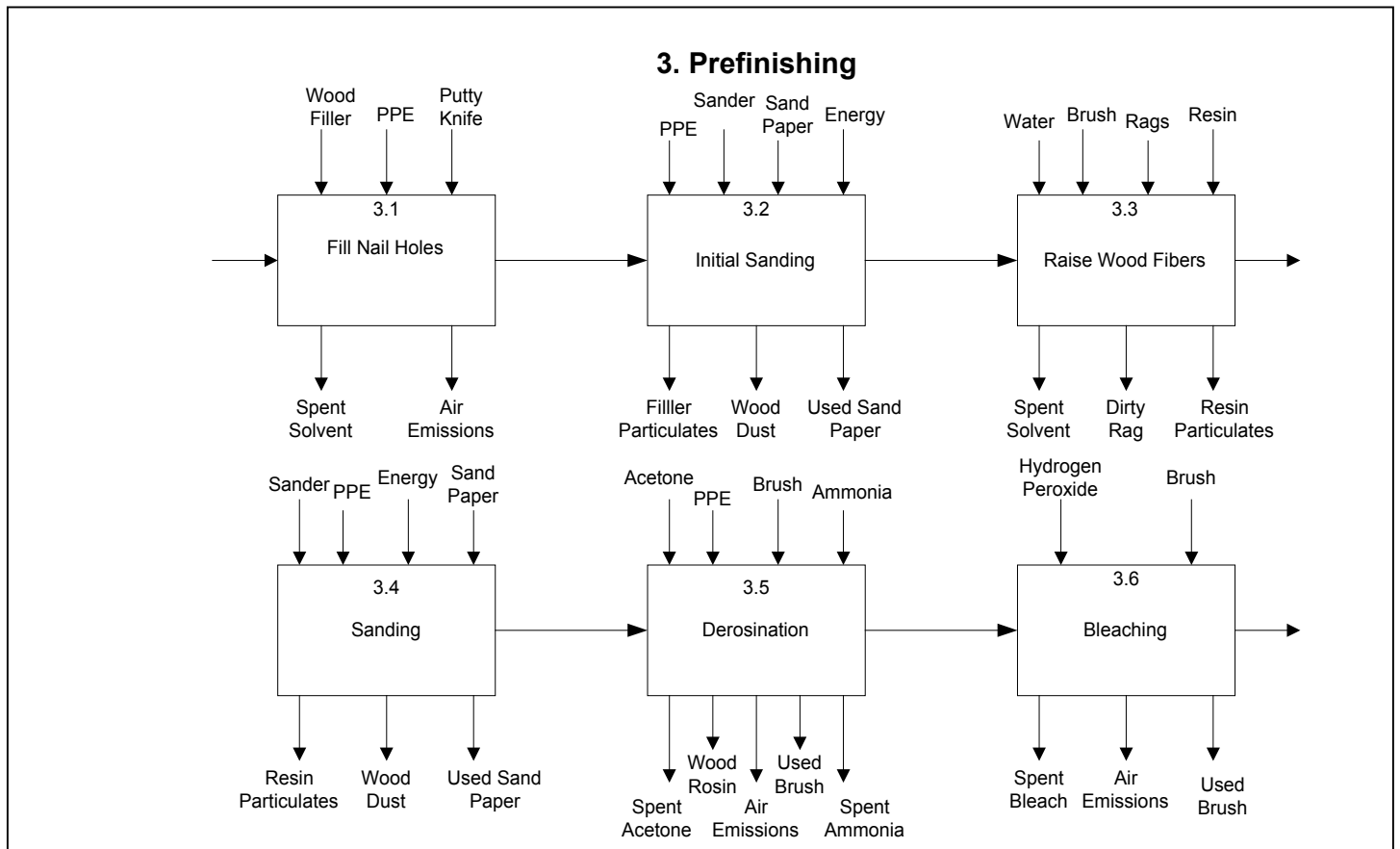


Figure 2: Cause and Effect Diagram

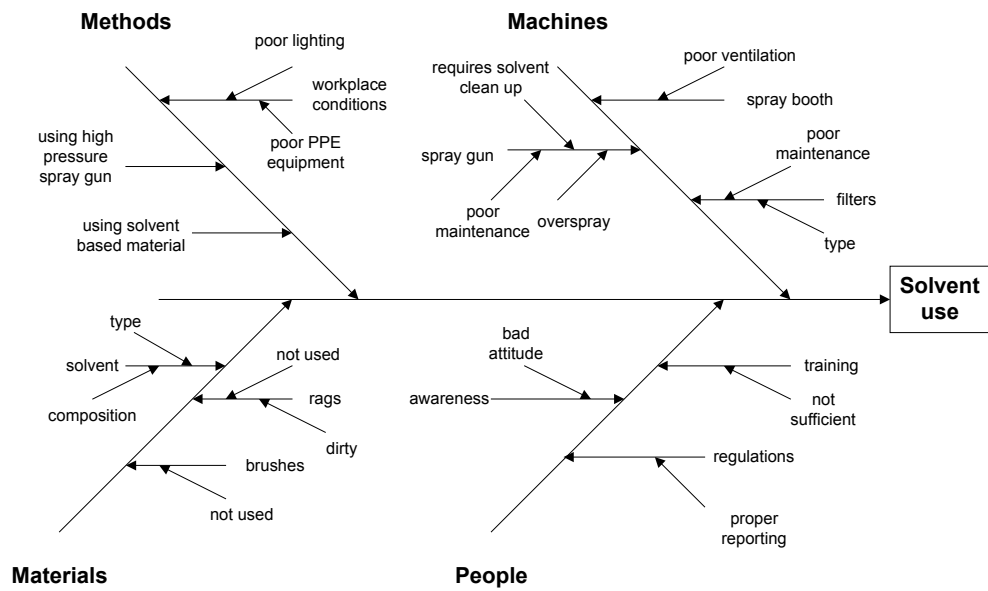


Figure 3: Dear Abby Letter

Dear Abby,

We run a small wood working shop. Use of solvent is our most expensive business issue. Solvents are highly regulated and we must comply with lots of regulations from air quality to hazardous waste to health and safety. Some wood working shops have had to pay lots of money for clean up of contaminated sites, which has put them out of business. These are issues that we wish to take seriously.

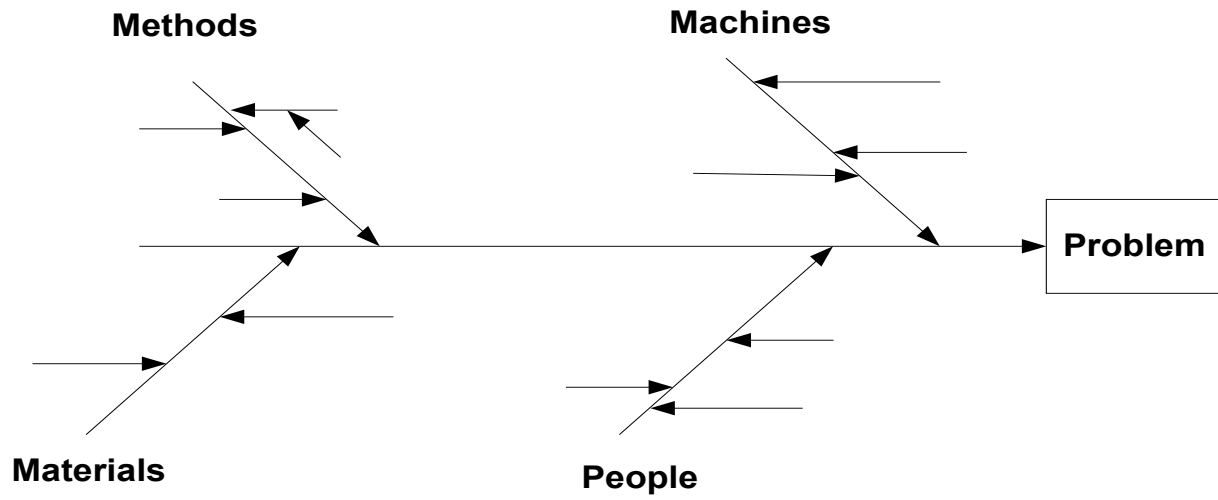
Our group did root cause analysis and we believe that our biggest problem is our high pressure spraying operation that causes a lot of overspray and wasteful use of finishing material. There is also the issue of making sure we are in compliance with regulations. However, as you know, changing equipment can be expensive and would probably require retraining of our employees.

Can you help us?

Signed,

Wood working in Santa Fe

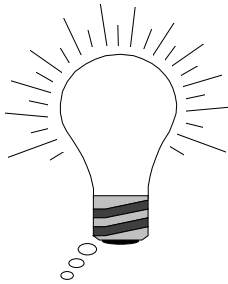
Figure 4: Root cause analysis: Fishbone Diagram



Tool #4: Brainwriting

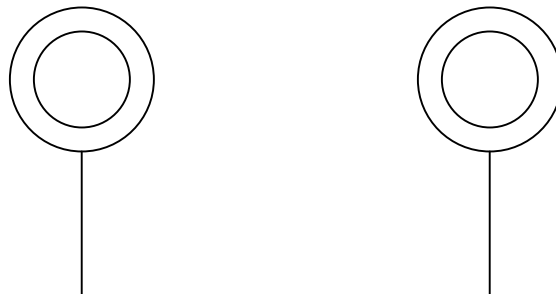
To address an opportunity effectively, it is important to recognize all alternatives. Very rarely is there one "right" way of preventing pollution. Instead, there are many different potential solutions. This tutorial presents a technique of listing many different alternatives for an opportunity.

Warm-up Exercise



You know the old adage “two heads are better than one”. This is especially true when trying to come up with new ideas. When you generate ideas in a group you will notice that each member of the group brings their unique set of experiences and strengths to the table.

Try the following exercise with your group. Look at the picture below (turn it on it's side and upside-down). What does it remind you of? Write down all the images that come to mind-even images that seem crazy should be included. Now go around the room, each person sharing one image with the group. One person should volunteer to keep a list of all the images. Repeat this step until every member of the group is out of images. How many images did the group come up with? How does this compare with the number of images you generated alone?



Introduction

In the last tool you evaluated all the probable causes of a loss and determined the underlying reason, or root cause. Once the root cause has been identified, you may be tempted to jump to a premature solution. When you address a loss without considering all the alternatives of prevention you may be overlooking the most appropriate option(s).

Looking for alternatives for pollution prevention by addressing its root cause is the next step towards addressing an opportunity. There are several tools available to help groups develop alternatives. You already explored one tool during the warm-up exercise. In this exercise you will explore another method-brainwriting. Brainwriting requires maximum interaction and creativity between group members. All possible alternatives, regardless of how far-fetched they appear, are considered by the group. Alternatives raised by the group may seem contradictory, or they may build on one another making them better. A comprehensive list of alternatives can then be compiled.

During this exercise you will:

- Conduct a brainwriting session.
- Develop a list of all possible alternatives for an opportunity for improvement.

Brainwriting

First you have completed your process map to see how you can optimize your processes and reduce losses. (*see Figure 1*) In the example provided, Activity-Based Costing helped to identify that 80% of the environmental costs associated with wood working was due to solvent use. Not only are solvents expensive, they are considered a hazardous waste and a hazardous air pollutant and they must be handled very carefully. Spills must be avoided to eliminate employee exposures and site contamination.

Root cause analysis determined that the greatest losses occurred due to employee handling practices. Employees control the wood working processes from the beginning to the end and also must deal with environmental, health and safety compliance issues.

The next step is to develop as many alternatives to solve the problem as possible. This is done through the process of brainwriting. Through brainwriting, staff works together to generate as many alternatives as possible regardless of how crazy they seem. In fact, to make it more interesting you can give a prize to the person that comes up with the craziest idea.

Make copies of the blank brainwriting sheet included at the end of this chapter. Make enough sheets so that each person on the brainwriting team has one per person with one blank sheet in the middle of the table. Place these sheets in the center of the table. Each person should take a sheet and write two alternatives on it and then place the sheet back in the center. Then take another sheet of paper and write two more alternatives on it. Every time someone picks up a sheet of paper, encourage them to read what others have written and try to make improvements to the alternatives listed. Someone could even say they think someone's idea is completely out in left field, if they try to make it better. Keep repeating this process until everyone runs out of ideas.

Now list all the alternatives that were discovered.

The alternatives on each sheet of paper should be read aloud and discussed. Many of the ideas may be the same and some may have small variations. The group should debate the small variations and eliminate the impossible alternatives. One comprehensive list should be developed-each idea only written once, although all variations of the same idea should be included.

Examples of brainwriting are provided below.

The next tool will present 'bubble-up-bubble-down'...a method for selecting the best option to prevent loss.

Figure 1: Wood Working Process Map

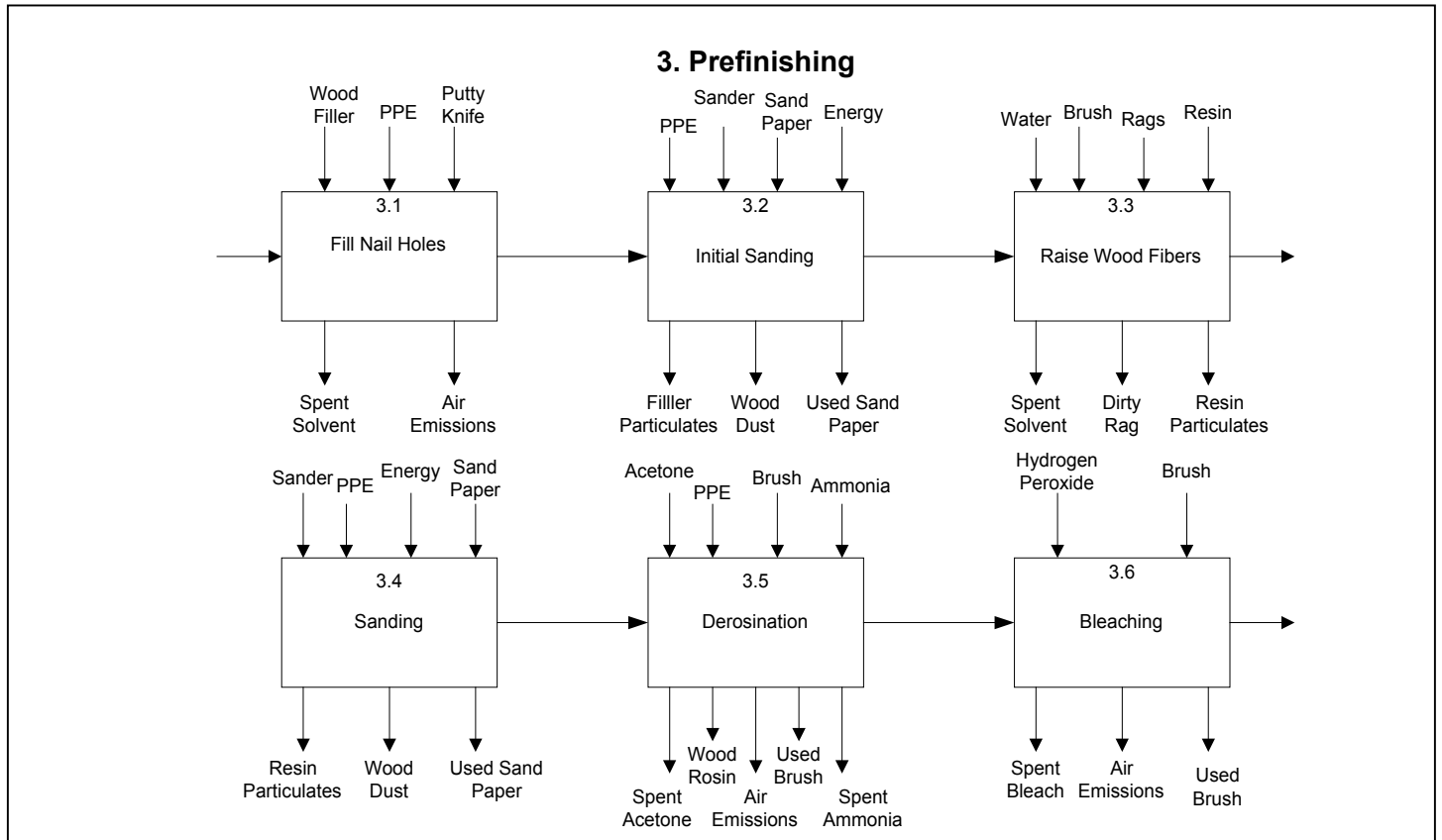


Figure 2: Sample of brainwriting

1. Use material that does not contain solvents to eliminate all environmental problems.	2. Train people to use the spray gun equipment better.
3. Pre-finish furniture parts with rags or brushes.	4. Use old solvent to pre-soak spray gun parts.
5. Convert to natural finishes.	6. Replace existing sprayer with new equipment that uses high-volume/low pressure.
7. Send furniture out to be finished.	8. Invest in better equipment.
9. Provide incentives for employees who reduce losses.	10. Create an employee problem-solving team to deal with waste of all kinds on a regular basis.

Figure 3: List of alternatives

1. Use material that does not contain solvents to eliminate all environmental problems.
2. Train people to use the spray gun equipment better.
3. Pre-finish furniture parts with rags or brushes
4. Start a “clean shop” program to train employees to keep work areas clean to prevent spills and waste.
5. Use old solvent to pre-soak spray gun parts
6. Begin an employee incentive program to reward best operating practices for operating a clean work area.
7. Replace existing sprayer with new equipment that uses high-volume/low pressure.
8. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
9. Create an employee problem-solving team to deal with waste of all kinds on a regular basis.
10. Convert to natural finishes.
11. Train workers on pollution prevention and ways to reduce and reclaim spills.
12. Provide incentives for employees who reduce losses.
13. Invest in better equipment.
14. Send furniture out to be finished.

Figure 4: Brainwriting Sheet

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

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Tool #5: Bubble Up-Bubble Down

You have now generated a list of alternatives for preventing an environmental loss in your business. But how do you choose the best alternative? This tutorial presents one method of prioritizing alternatives to ensure that the most appropriate alternative is selected.

Warm-up Exercise



Most of us use lists from time to time to make sure that we don't forget to do the things that we need to get done. Without a shopping list, for example, we may return from the store without milk, the reason why we went in the first place. Certain limitations, like time or money, may cause us to drop things off our list. We often need to prioritize and make sure that the most important things get done.

Make a list of the things that you need to get done tomorrow (try to list at least ten things). List these items in the order that they come to mind. Now prioritize this list by putting the most important items on the top of the list and the least important items on the bottom. You should now have a "rank ordered" list. If you only have time to complete one of the items on your list, which would it be? You should have answered the item on the top of the list the most important item.

Introduction

A comprehensive list of pollution prevention alternatives was developed in the last tool using a technique called brainwriting. The alternatives generated during this tutorial can range from operational changes, such as employee training and improvements in operations, to technology changes, such as changing a solvent. The next step is to choose one alternative that is capable of being worked with successfully. Additionally, it is important to select the optimal solution for your business. To accomplish this, you must consider the *feasibility* of each alternative. Such factors as effectiveness, implementability, cost, and potential ramifications of each alternative should be discussed. Personal preferences and biased information should not enter into the decision-making process.

There are several tools available to aid a group in selecting an alternative and avoid bias. These tools allow a group to rank and prioritize alternatives using a systematic approach. When all the alternatives are listed, suggestions are made by the group to improve even the worst alternatives. At this point, many of the alternatives may be eliminated: every realistic alternative remains on the list. These remaining alternatives can then be sorted based on the factors presented above and any other factors that may affect a particular business. The method of selection presented in the exercise is the bubble-up-bubble-down. This tool uses a forced pair comparison to rank alternatives. Using this method you will be able to find the most effective solution to the selected loss.

During this exercise you will:

- Evaluate all alternatives.
- Use the bubble-up-bubble-down method to reach a decision on the best alternative.

Bubble-Up, Bubble-Down

Take the list of alternatives and compare the first two alternatives. Decide which of the two is the best and move this alternative to the top of the list. Go to the next, or third alternative and compare it to the second. If it is better than the second, move it up and compare it to the first, if not, leave it in the third position. Continue this process until all the alternatives are rank ordered. This process should go fairly quickly. Make sure you listen to everyone's opinions and objections. Again, factors to consider are cost, effectiveness and the ability to implement the alternative.

Bubble-up, Bubble-down should generate much discussion among employees on the best solutions. These discussions will help to increase buy-in to the alternatives. As a rule, employees never resist their own ideas.

An example of how the Bubble-Up Bubble-Down method was applied to the list of alternatives generated in the last tool are listed below.

Typically, the three or four alternatives that “bubbled-up” to the top of the list are the easiest and cheapest to implement, the “low-hanging fruit”. The alternatives in the middle may require more research or study to see if they are feasible. The ideas at the bottom of the list may require major equipment changes or capital investments. It is important to keep the entire list on file as part of your continuous environmental improvement program.

The next step is to develop an action plan. Action planning is essential to assure that ideas are implemented!

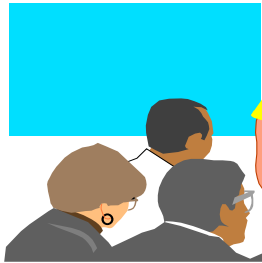
Figure 1: List of alternatives prioritized using Bubble-Up, Bubble-Down

1. Replace existing sprayer with new equipment that uses high-volume/low pressure.
2. Train people to use the spray gun equipment better.
3. Invest in better equipment.
4. Use material that does not contain solvents to eliminate all environmental problems.
5. Pre-finish furniture parts with rags or brushes
6. Use old solvent to pre-soak spray gun parts
7. Begin an employee incentive program to reward best operating practices for operating a clean work area.
8. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
9. Create an employee problem-solving team to deal with waste of all kinds on a regular basis.
10. Convert to natural finishes.
11. Train workers on pollution prevention and ways to reduce and reclaim spills.
12. Start a “clean shop” program to train employees to keep work areas clean to prevent spills and waste.
13. Provide incentives for employees who reduce losses.
14. Send furniture out to be finished.

Tool #6: Action Planning

Being able to successfully manage a project is important when trying to accomplish a task, especially when you are under a deadline. You need to set up a schedule, ensure that you have the necessary resources, and assign the right person to each part of the job. In this tutorial you will create an “action plan” for the implementation of an alternative to prevent pollution.

Warm-up Exercise



Your group has been assigned the task of making chocolate chip cookies. The cookies need to be ready in one hour and the cooking time is twelve minutes. Pick a person to manage this project. The manager must then assign the ten tasks listed below to individuals in the group.

You will need to know how much time is required for each task, what tasks need to be accomplished before others, what resources (i.e. bowls, flour etc.) are required, and what the most efficient way of organizing these tasks (and remember the clock is ticking). Create a schedule.

Making chocolate-chip cookies:

- Mix dry ingredients
- Mix wet ingredients
- Put the batter on the pan and put pan into the oven
- Combining wet and dry ingredients
- Turn on the oven
- Taste cookies
- Wash tools and utensils
- Grease pan
- Take cookies out of the oven

Developing an Action Plan

Before you begin to implement your alternative you should complete this questionnaire. It will ensure that you are being thorough in your planning and have considered all the important issues that may arise such as the resources that are needed and the problems that could may occur. (*see Figure 2*)

Things to consider in developing an action plan are resources needed, both financial and human resources; the need for pilot testing or bench scale testing; information sources from the outside such as trade associations, vendors and suppliers and the Environment Department. Other issues such as employee support and maintaining product or service quality should be considered. A list of questions that should be considered during action planning is as follows:

Action Planning Questionnaire

1. What is the overall objective and ideal situation?
2. What steps are needed to get there from here?
3. What actions need to be done?
4. Who will be responsible for each action?
5. What is the best sequence of action?
6. How long will each step take and when should it be done?
7. How can we be sure that earlier steps will be done in time for later steps that depend on them?
8. What training is required to ensure that all staff have sufficient know-how to execute each step in the plan?
9. What standards do you want to set?
10. What volume or quality is desirable?
11. What resources are needed and how will you get them?
12. How will you measure results?
13. How will you follow up each step and who will do it?
14. What checkpoints and milestones should be established?
15. What are the make/break vital steps and how can you ensure they succeed?
16. What could go wrong and how will you get around it?
17. Who will this plan affect and how will it affect them?
18. How can the plan be adjusted without jeopardizing its results for the best response and impact?
19. How will you communicate the plan to generate support?

Now put all this information in an Action Plan Form. Most of the information you need should come from your answers to the questionnaire. The specific task, or step, to be accomplished is written in the first column under "Action." In the following column list the person who is

responsible for completing this task. A performance standard should then be provided. This standard is a way of establishing how well a task needs to be performed. Under “monitoring technique” enter a measurable goal or target used to track the plan's implementation. A firm deadline should then be set, and finally, indicate the resources that are needed to perform each task. This form will help you organize your thoughts, keep track of all the actions that need to be completed, and ensure that the proper quality is being maintained.

Use the form provided to track implementation of the project and to measure its success. A sample action planning form is included at the end of this section.

Overall Target: Employee Incentive Program					
Action	Responsible person	Performance standard	Monitoring technique	Completion deadline	Resources needed
1. Investigate sources of equipment	Tom	List of vendors	Discuss list with Dick the owner	Jan 15	Team of Tom, Dick and Harry
2. Bring in equipment for review	Tom	Approved list of vendors by Dick	Dick allocates time for employees	Feb 1	Shop employees
3. Employees try out equipment and write up results	Harry	How good does the equipment clean parts	Time to clean parts	March 1	Shop employees
4. Have team review results and select vendor	Harry	Compare against existing equipment	Time, quality and cost	April 15	Team of Tom, Dick and Harry
5. Purchase equipment	Dick	Delivery schedule	Dick allocates funds	April 30	Capital funds
6. Train employees on how to use new equipment	Harry	Time and quality of cleaning parts	Costs of new equipment versus old	June 1	Employees time

Congratulations!!! You have completed the Pollution Prevention Training. Now it is time to put these tools to work and remember pollution prevention is an ongoing process. If you continue to implement pollution prevention in your business, you will increase the efficiency of your process while helping the environment. Simply revisiting your process maps and Pareto Chart once a year and using the tools to continue to make improvements will make a big difference in your operation. Ongoing use of these tools will help you to participate in the Green Zia Environmental Excellence Program.

Here are a few suggestions to make pollution prevention continue to work for you:

- ***Return to the Nothing to Waste activities and concepts as you make business decisions.***
- ***Schedule regular pollution prevention reviews of your business.***

Remember: Pollution Prevention saves resources, saves money, and prevents accidents!

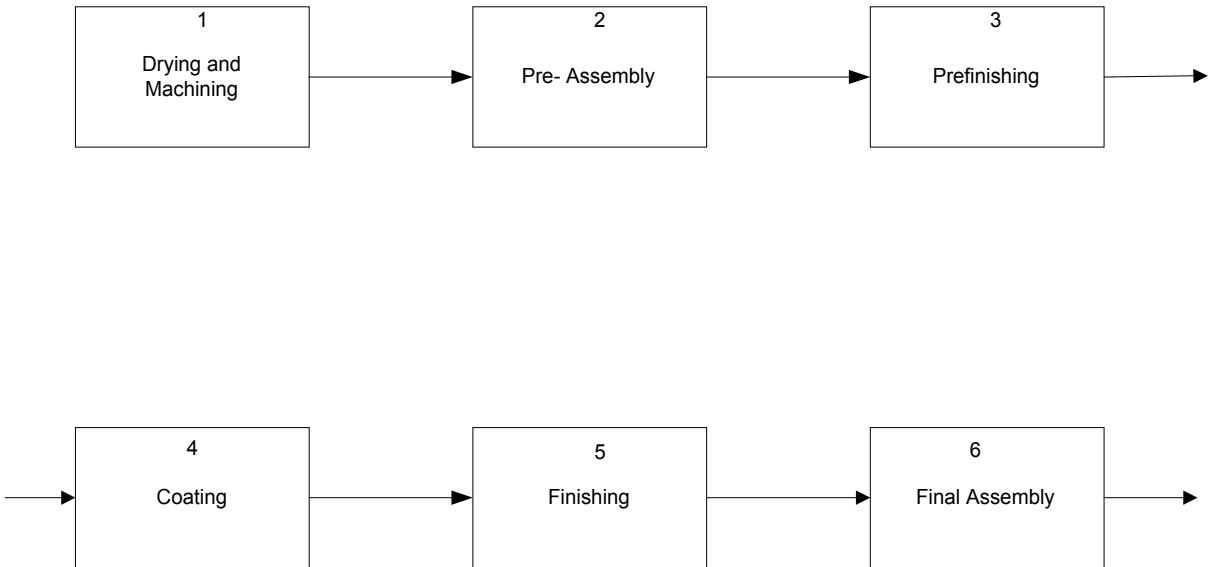
Overall Target					
Action	Responsible person	Performance Standard	Monitoring Technique	Completion Deadline	Resources Needed
1.					
2.					
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Process Maps for Wood Working Shops

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General Process Map for Furniture Manufacturing



Wood Working Shop Process Maps

Map 1.0: Drying and Machining

1.1 Drying kiln

Raw lumber generally has a high moisture content and must be dried before it can be used in furniture. The lumber is usually dried in a kiln using wood waste as the fuel source.

1.2 Cut lumber to size

After the wood is dried, it is sawed into a shape of the approximate dimensions of the individual furniture pieces. Power saws are generally used such as table saws, circular saws, band saws, scroll saws, and radial arm saws.

1.3 Size flat surfaces

The cut pieces of wood are then planed to make two surfaces parallel, flat, and the final dimensions of the furniture pieces. Both power and hand planner are used.

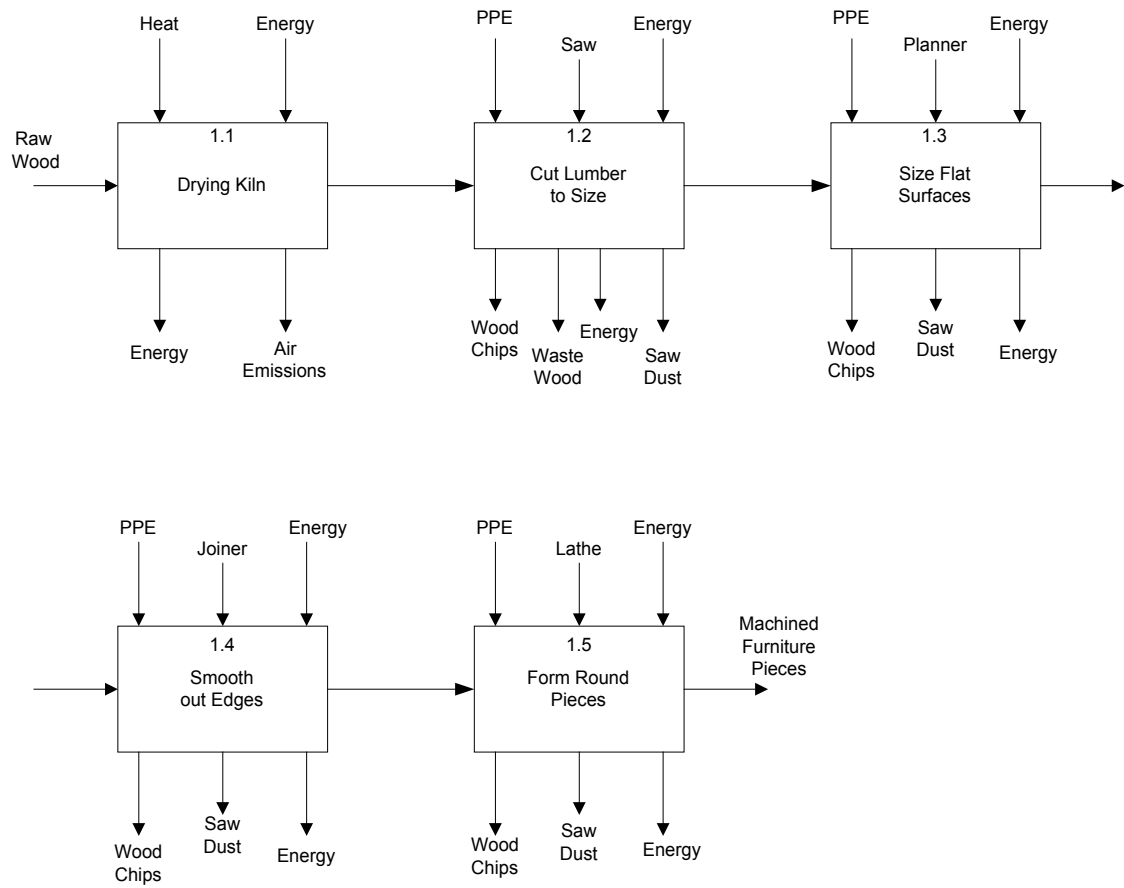
1.4 Smooth out edges

The wood is then sent through a joiner to square up the edges and make them the final dimensions of the furniture pieces. This is generally done using a power joiner.

1.5 Form round pieces

Some of the pieces of furniture are required to be round such as table legs. This is done on a power lathe.

1. Drying and Machining



Map 2.0: Pre-Assembly

2.1 Place wood pieces in jig

Generally furniture is made up of sub-assemblies that are easier to handle and apply finishes to. These sub-assemblies are made up from the wood pieces machined in the previous steps. They are generally placed in some sort of a jig or merely clamped in place.

2.2 Glue pieces together

Many of the subassemblies are glued together using adhesives containing solvents.

2.3 Nail pieces together

Sometimes the subassemblies also require nailing. In some cases nailing is used instead of glue. A power nailer is generally used.

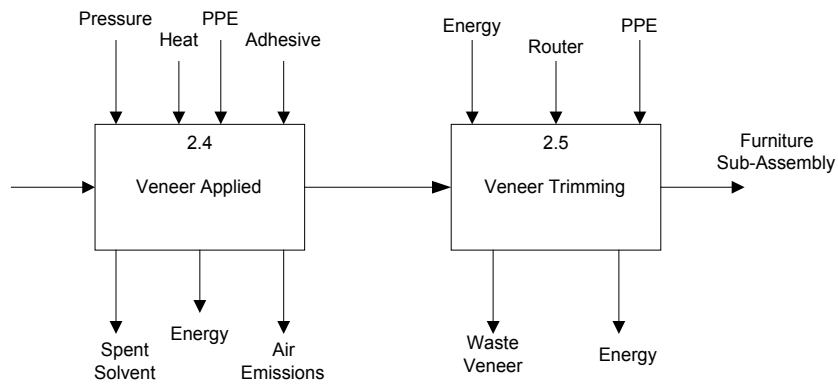
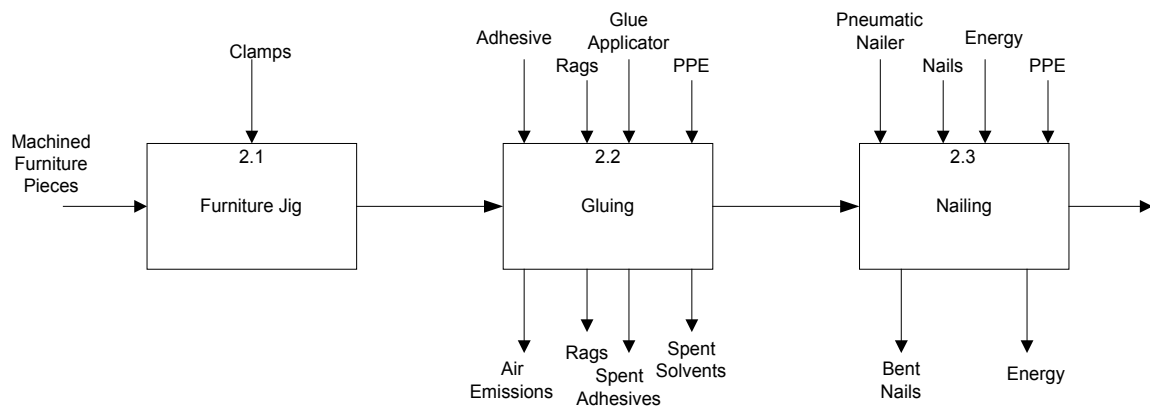
2.4 Apply veneer

A veneer is sometimes applied to some of the surfaces. This is done using an adhesive that contains solvents. Heat and pressure may also be applied.

2.5 Trim veneer

Usually the veneer is slightly larger than the surface it was applied to. This requires trimming to insure a perfect fit. A power router is generally used.

2. Pre-Assembly



Map 3.0: Pre-Finishing

3.1 Fill nail holes

If nails were used in the pre-assembly they are countersunk using a punch. A wood putty that generally contains a solvent is then used to fill in the nail holes.

3.2 Initial sanding

The surfaces of the furniture pieces are then sanded after the putty has dried. This can be done using either a hand or power sander such as a disk, belt, or roller sanding machine.

3.3 Raise wood fibers

To get an even smoother surface the furniture piece is sprayed, sponged, or dipped with water to cause the fibers of the wood to swell and raise. After the surface is dried, a solution of resin is applied and allowed to dry, causing the raised fibers to become more brittle.

3.4 Sanding

The raised fibers are then sanded down to form a particularly smooth surface. This can be done using either a hand or power sander.

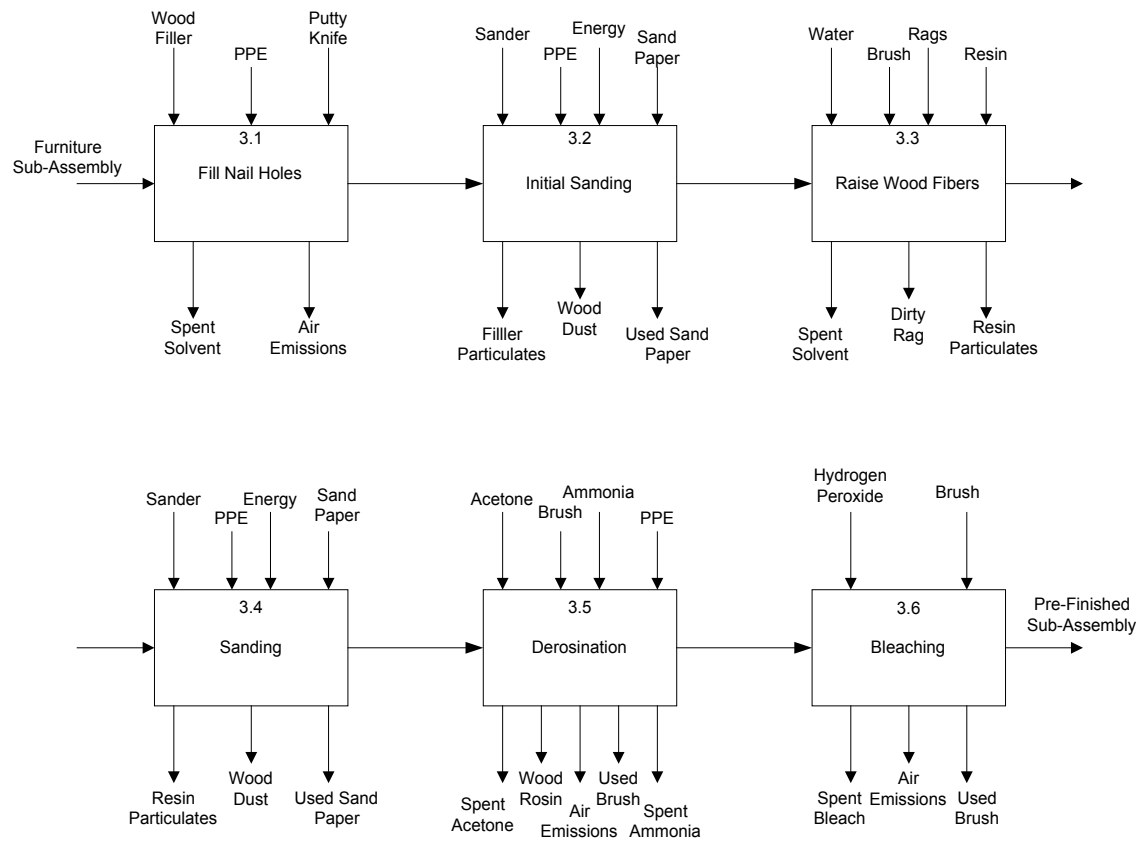
3.5 Derosination

Because certain types of wood contain rosin, which can interfere with the effectiveness of certain finishes, a process known as derosination may be employed. This is accomplished by applying a mixture of acetone and ammonia. This is generally applied by brush.

3.6 Bleaching

Once the unwanted rosin is removed from the wood, bleaching is done to lighten the color of the wood when the natural color is darker than the stain or finish to be applied. The process entails spraying, sponging, or dipping the wood into a bleaching agent, such as hydrogen peroxide.

3. Pre-Finishing



Map 4.0: Coating

4.1 Place furniture pieces in spray booth

Most coatings are applied by spraying.

4.2 Apply coating

The most common method of spraying used, is a spray gun powered by compressed air with high pressure to atomize the coating material. Most of the stains used contain solvents. The operators are required to wear protective personal equipment (PPE) such as masks.

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4.3 Light sanding

After the piece has been allowed to dry it is lightly sanded either by hand or with a power sander. The piece may then be put back into the spray booth for an additional coating. Steps 4.2 and 4.3 are repeated as many times as necessary to obtain the desired appearance.

4.4 Wash coating

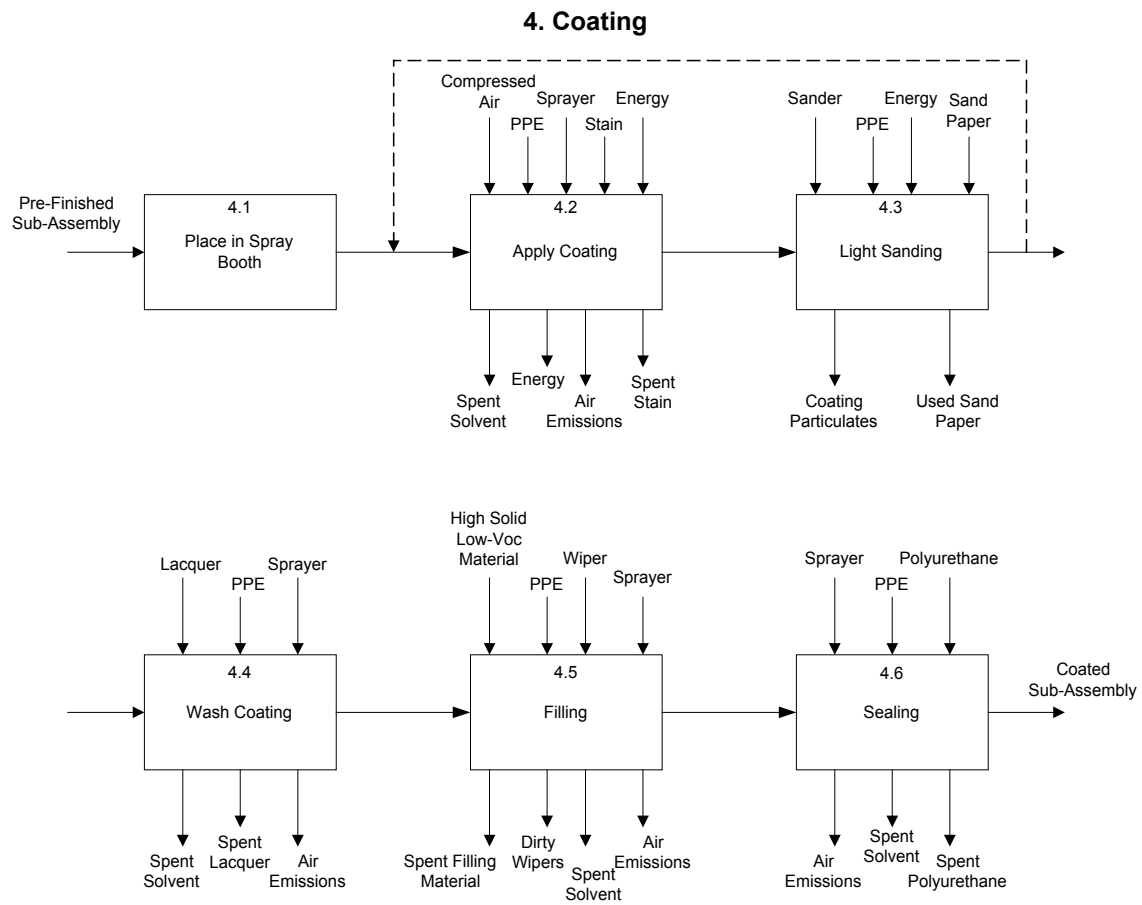
After staining, a washcoat, consisting of 2 to 13 percent solids by volume, is applied to the furniture piece. Washcoating is used to aid in adhesion, assist in filling or color uniformity, and partially seal the wood from subsequent staining operations. Nitrocellulose-based lacquers containing solvents are generally used and are sprayed on.

4.5 Filling

Fillers are applied to the wood surface to produce a smooth, uniform surface for later stages in the finishing process. Fillers usually range in solids contents from 10 percent to 45 percent by volume in a solvent base. Fillers are usually spray applied, then wiped into the wood.

4.6 Sealing

Sealing consists of applying one or many coats of sealer. The primary purposes of sealers are to provide adhesion, make sanding more effective, to seal the wood, and establish a foundation for final finishing. Solids contents of sealers, such as polyurethane, typically range from 10 to 30 percent by volume in a solvent base. Sealers are usually sprayed on.



Map 5.0: Finishing

5.1 Light sanding

After the sealer has been allowed to dry the furniture piece is lightly sanded either by hand or with a power sander.

5.2 Apply topcoat

After the furniture piece has been coated, a topcoat, such as varnish or shellac, is applied in one of the final stages of the finishing process. Top coats provide a clear coat whose function is to protect the color coats, enhance the beauty of the furniture, and provide a durable finish. Typical solids contents range from 13 to 30 percent by volume in a solvent base. Topcoats are usually sprayed on.

5.3 Light sanding

After the piece has been allowed to dry it is lightly sanded either by hand or with a power sander.

5.4 Apply second topcoat

A second topcoat is usually applied in the same fashion as outlined in step 5.2.

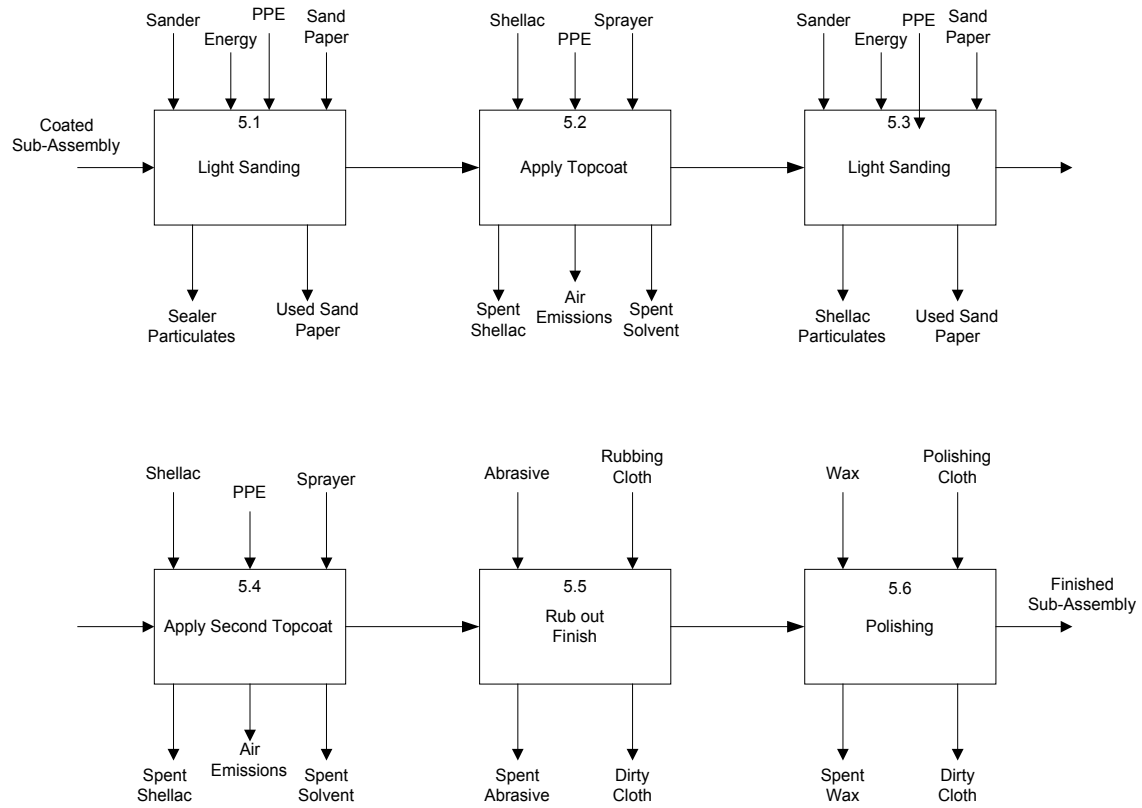
5.5 Rub out finish

Rubbing consists of the application of an abrasive in conjunction with a lubricant to level the topcoat.

5.6 Polishing

Polishing consists of the application of soft abrasives or possibly only waxy ingredients to increase the gloss. This is the final process finishing step.

5. Finishing



Map 6.0: Final Assembly

6.1 Place furniture sub-assemblies in jig

The sub-assemblies are generally held together in some sort of a jig or merely clamped in place.

6.2 Connect sub-assemblies together

The sub-assemblies can be connected together using adhesives containing solvents, or nailed together using a power nailer, or screwed together using wood screws, or bolted together using bolts and nuts, or any combination of the above. As an example the process map 6.2, shows the sub-assemblies being glued together.

6.3 Inspect final product

The furniture is inspected for any damage, imperfections, or missing pieces.

6.4 Repair any problems

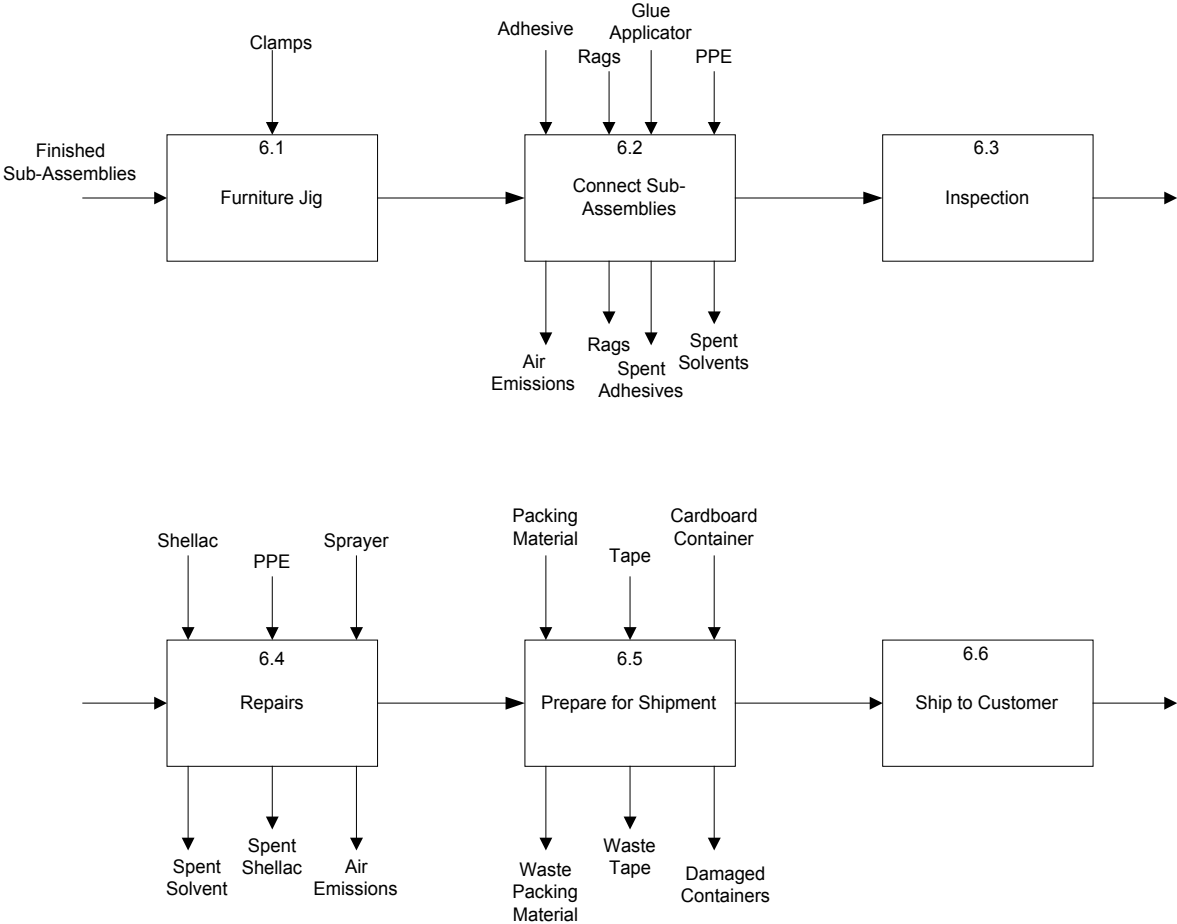
This can included a variety of tasks such as filling in holes, refinishing an area of the furniture, or replacing damaged sub-assemblies. As an example the process map 6.4, shows the furniture having an additional coating of shellac. The furniture would most likely then be rubbed out and polished as shown in steps 5.5 and 5.6.

6.5 Prepare for shipment

Generally furniture is packed in a cardboard container with some sort of material to protect it from damage during shipment.

6.6 Ship to customer

6. Final Assembly



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Wood Working Shops
Regulatory and Pollution
Prevention Guidance and
Other Resources

GENERAL REGULATORY GUIDANCE FOR NEW MEXICO SMALL BUSINESSES

The purpose of this briefing paper is to assist small businesses in New Mexico in trying to understand the environmental regulatory requirements associated with doing business by giving a general overview. It is not intended to be a substitute for actual regulations. Businesses are responsible for operating their business in full compliance of the law (regulations). Each bureau in the New Mexico Environment Department (NMED) have staff available that can help you directly in understanding what is expected of your business from a regulatory point of view. It is in your best interest to contact the appropriate bureau if you have questions.

Periodically the Pollution Prevention (P2) Program in NMED will issue specific guidance briefing papers as an attachment to this document for certain businesses. These will be designed to provide additional information to a specific business. For information call the NMED Pollution Prevention Program staff at 505-827-0677 or the Technical Resource Center in Albuquerque at 505-843-4251.

AIR EMISSION REGULATIONS:

The EPA, in an attempt to control air pollution through regulations, has created a set of rules with many acronyms. Since businesses can come across these acronyms in many publications, they are listed below:

NESHAP:	National Emission Standards for Hazardous Air Pollutants
NAAQS:	National Ambient Air Quality Standards
HAP:	Hazardous Air Pollutants
TAP:	Toxic Air Pollutants
OEL:	Occupational Exposure Limits
VOC:	Volatile Organic Compounds
MSDS:	Material Safety Data Sheet
CTG:	Control Techniques Guidelines
MACT:	Maximum Achievable Control Technology
BACT:	Best Available Control Technology
GACT:	Generally Available Control Technology
RACT:	Reasonably Available Control Technology

Much of the national strategy for controlling air pollution centers around the NAAQS. These standards set limits for the concentration in the ambient (outdoor) air of the six most common air pollutants: Ozone, Carbon Monoxide, Particulate Matter, Sulfur Dioxide, Nitrogen Dioxide, and Lead.

The EPA has established industry based regulatory requirements for the most serious air pollutants, such as HAPs. In many cases the EPA has also established Control Techniques Guidelines that require industries to use certain technologies, such as MACTs.

Any business that has the potential of releasing pollutants to the ambient (outdoor) air, such as VOCs, HAPs, or Criteria Pollutants may be subject to the Air Quality Regulations depending on the amount of pollutants being released. These pollutants are used to determine if a facility is a major or minor source of air pollution and whether or not a business will need an Air Quality Permit. A major source is determined as a function of the amount of HAPs or Criteria Pollutants

a business has the potential to emit. For HAPs it is 10 tons per year of any single HAP or 25 tons per year of the total HAPs. For the Criteria Pollutant it is 100 tons per year of any criteria pollutant. In addition the State of New Mexico has added TAPs as a category to be regulated. Some businesses that would normally be considered a major source can be classified as a minor source by changing the way they conduct their business. Businesses classified as a major source have significant regulatory requirements such as annual fees, maintaining progress reports, records, and a compliance schedule, monitoring emission limits, as well as the possible requirement to have specific control technology installed (MACT, GACT, or RACT). All major sources are required to obtain a Title V Permit. It is generally desirable for a business not to be classified as a major source. An EPA document "Potential to Emit, A Guide for Small Businesses" (EPA-456/B-98-003) is available from the EPA and it may help you to understand Air Quality Regulations.

The State of New Mexico, in addition to HAPs and Criteria Pollutants, has also generated regulations on Toxic Air Pollutants (TAPs) with OELs. These basically limit businesses from allowing TAPs to be emitted to the outside air around their building. OSHA regulates the same kinds of exposure limits inside of a building.

Due to the complexities of Air Quality Regulations, the harm air emissions cause to the environment, and in many cases the high costs associated with "end of the pipe" control technology, it is in the best interest of any business to evaluate their operations with the ultimate goal of eliminating all air pollutants as much as possible.

What all this means is, with few exceptions, the Air Quality Regulations that apply to your business will mostly be determined by what your business does. The best way to find out what air quality regulations apply to your business is to contact the New Mexico Environment Department (NMED) Air Quality Small Business Assistance Program (SBAP) at. Businesses –1-505-827-1294 are located in Bernalillo County are locally regulated with respect to air emissions. For assistance you need to call the City of Albuquerque/Bernalillo Air Quality Assistance Program (AQAP) at 505-768-1964.

HAZARDOUS WASTE REGULATIONS:

Any business that generates waste that is classified as "listed" or "characteristic" in RCRA must deal with this waste as outlined in the New Mexico Hazardous Waste Regulations. The EPA has generated a list of chemicals that are considered hazardous. They have also stated that certain materials that exhibit a hazardous characteristic (ignitibility, corrosivity, reactivity, or toxicity) should be considered hazardous. To determine which products used in your business contain hazardous material, contact either the EPA or the New Mexico Hazardous Waste Bureau. In some cases this information will be contained on the Material Safety Data Sheet (MSDS) that came with the product.

It is important to understand that any product that contains "listed" or "characteristic" material is only regulated by the hazardous waste regulations when it becomes a waste. Examples are when the product is no longer to be used for its intended purpose and is to be gotten rid of, the shelf life of the product has expired, the product leaks from a piece of equipment, or the product is accidentally spilled. It is also important to note that any product to be discarded that contains one or more hazardous materials is also hazardous waste. Examples are hazardous waste mixed with solid waste, rags to clean up spilled hazardous materials, or wastewater from a process that used a hazardous material.

All businesses that generate hazardous waste are classified based on the quantities of hazardous waste they generate monthly. The three classifications are:

1. Conditionally Exempt Small Quantity Generator (CESQG): generates less than 220 pounds or 100 kilograms of hazardous waste per month. A CESQG cannot accumulate more than 2,200 pounds or 1,000 kilograms of their combined hazardous waste at any one time. Usually this amounts to about one-half of a 55-gallon drum. CESQG's may dispose of their hazardous waste by mixing it with a solid waste, assuming there are no free liquids in the waste, and taking it to a permitted municipal solid waste (MSW) landfill. You need to verify that the MSW landfill will accept the mixed waste.
2. Small Quantity Generator (SQG): generates between 220 pounds and 2,200 pounds or 100 kilograms and 1,000 kilograms of hazardous waste per month. No more than 13,200 pounds or 6,000 kilograms may be stored on site any longer than 180 days and must be disposed of at a facility permitted to recycle, treat, store, or dispose of hazardous waste.
3. Large Quantity Generator (LQG): generates more than 2,200 pounds or 1,000 kilograms of hazardous waste per month. Hazardous waste with no weight limit may be accumulated for no more than 90 days unless permitted by the State.

Each classification has different record keeping, manifesting, and reporting requirements. Since a businesses' classification is based on a monthly generation, it is possible to move from one classification to another on a regular basis. All generators of hazardous waste are required to register with the Hazardous Waste Bureau and pay a generator fee based on their classification.

The Hazardous Waste Bureau has an established outreach program that can assist any business in determining their classification and the regulatory requirements that go with it. You may contact the Bureau at 505-827-2528.

It is important for any business generating hazardous waste to understand that RCRA has established a "cradle to grave" responsibility for the generator of said waste. In effect this means that if the hazardous waste the business generates contaminates soil, surface water, or ground water in any manner until it is properly disposed of, the business will be held responsible for the clean up of the contamination. The cost of clean up could be substantial. It is therefore imperative for any business to make sure trained employees handle their hazardous material properly to avoid accidental spills, to only use permitted haulers, to make sure their waste goes to a RCRA permitted facility, to properly store their hazardous waste, and never dispose of their hazardous waste at their facility. It is also advisable to seal the floor of the facility if you use a hazardous material in a liquid form in your operation.

The best way for any business to avoid the costs of contamination clean up is to eliminate the use of hazardous materials in their operation. A complete understanding of how a business conducts its processes is required to determine the best way to eliminate or at least reduce the amount of hazardous waste being generated. A Pollution Prevention Program has been established at the New Mexico Environment Department to assist businesses in evaluating their processes. The number to call at NMED is 505-827-0677 or you can call the Technical Resource Center in Albuquerque at 505-843-4251.

The New Mexico Environment Department has a 24-hour emergency reporting number that can be called in case of an incident dealing with hazardous material. The number is 505-827-9329.

WASTEWATER REGULATIONS:

Any business that generates wastewater that contaminates surface water or ground water can be held responsible for the cost of cleanup. If the contaminant is a RCRA “listed” or “characteristic” waste above the concentration value allowed, then the wastewater is by definition a hazardous waste and must be dealt with under New Mexico Hazardous Waste Regulations. Placing hazardous wastewater directly onto or into the ground is strictly prohibited. Since the cost of cleaning up either surface water or ground water can be substantial, it is in the best interest of any business to eliminate, minimize, and/or control its wastewater.

If non-hazardous wastewater is being discharged so that it can move directly or indirectly into ground water (e.g. septic system, dry sump, etc.) a business is required to file a “Notice of Intent to Discharge” with the New Mexico Ground Water Bureau in accordance with the NM Water Quality Act. The Bureau will then determine if the business requires a Discharge Permit. In some cases the business may be required to request a NPDES Permit from the EPA if the discharge is to surface water.

If non-hazardous wastewater is being placed into a sewerage system a business is required to notify the local Publicly Owned Treatment Works (POTW) the nature and concentrations of the contaminants in the wastewater. Attached is a listing of the New Mexico Publicly Owned Treatment Works. Wastewater that has been determined to be hazardous is prohibited from being placed in any sewerage system.

Businesses need to be aware that even though their wastewater going into the sewerage systems is allowed by the POTW, this does not necessarily relieve them of potential contamination liability. A good example is the case in which a sewer pipe leaks and the wastewater contains hazardous constituents, below RCRA levels, that were generated by your business. Over time the wastewater seeps into the ground water and the concentrations exceed State or Federal water quality standards. If the contamination source can be traced back to your business, you could be liable for the cost of cleanup. Most businesses will find that the costs associated with proper handling of their wastewater are far cheaper than the cost of cleaning up ground water. Prevention is an inexpensive insurance policy.

Another potential source of contamination is through the foundation of your building. An example would be where a business handles hazardous material as a regular part of doing business and a spill occurs that seeps through cracks in the floor. Eventually it reaches ground water and is detected through monitoring of the ground water. Assuming it can be traced back to your business, you could then be held responsible for the cost of clean up.

Any business that generates wastewater from sources other than lavatories, cafeterias, etc., should evaluate ways in which the wastewater can be eliminated, reduced, recycled, reused or handled in such a fashion that the risk of liability for contaminating surface water or ground water is virtually zero. This should include dealing with hazardous waste and all wastewater in a proper fashion, sealing cracks in floors, training of employees, and possible treatment of their wastewater before it leaves their premises.

If you have any questions you can contact the Ground Water Bureau at 505-827-2965 and the Surface Water Bureau at 505-827-0187.

OSHA REGULATIONS:

Every business is required to provide a safe and healthy working environment for its employees. The Occupational Health and Safety Bureau (OHSB) is responsible for making sure businesses are in compliance with OSHA regulations. OSHA regulates permissible exposure limits (PEL's) for employees exposed to certain air contaminants in the workplace. The Bureau conducts regular inspections of facilities and evaluates the establishment for safety and health compliance. The OSHB has a consulting program to assist facilities to be in compliance with OSHA regulations. The service is free of charge to New Mexico small businesses. Attached is a copy of "Frequently Asked Questions" about the program, a copy of "General Health & Safety Issues", as well as a poster you are encouraged to display at your facility. They can be contacted at 505-827-4230.

UNDERGROUND STORAGE TANK REGULATIONS:

Any business that stores a regulated substance in an underground storage tank that is not directly connected to some sort of processing operation may or may not be regulated by the Underground Storage Tank Bureau (USTB). If the substance is a hazardous waste, it is regulated under RCRA and you would need to contact the Hazardous Waste Bureau. Since there are a variety of circumstances whereby UST regulations have jurisdiction, it is best to contact the USTB directly for guidance. They can be contacted at 505-827-0188.

SOLID WASTE REGULATIONS:

The Solid Waste Bureau (SWB) deals primarily with regulating solid waste facilities (non-hazardous waste landfills, transfer stations, and recycling facilities) and illegal dumping. The only responsibility for a small business is to see that their non-hazardous waste is either sent to a recycler or to a permitted landfill by a registered solid waste hauler. For information the SWB can be contacted at 505-827-0197.

SPECIFIC REGULATORY GUIDANCE FOR WOOD FINISHING SHOPS

This briefing paper is intended to be attached to the "General Regulatory Guidance for New Mexico Small Businesses" to provide additional regulatory information specifically to "Wood Finishing Shops". It is not intended to be a substitute for actual regulations. If you have questions concerning your regulatory responsibilities, you are encouraged to contact the appropriate bureau.

AIR EMISSION REGULATIONS:

Attached is a letter from the Environment Department explaining the finalized regulation from the EPA, which limits emissions of hazardous air pollutants (HAPs) from wood furniture manufacturing operations. Also attached is a copy of the "Initial Notification Report" as well as a copy of the "Monthly Recordkeeping Worksheet" and a "Rolling 12 Month Recordkeeping Worksheet" that will help you in maintaining the necessary records. If you have any questions you can contact the NMED Small Business Assistance Program at 1-800-810-7227 or the City

of Albuquerque Air Quality Assistance Program at 505-768-1964 if your business is located in Bernalillo County.

HAZARDOUS WASTE REGULATIONS:

The most common hazardous waste comes from solvent-based products used in stripping wood (methylene chloride, xylene, acetone, ethyl acetate, and toluene), coating wood (lacquers, stains, paints, and thinners), and cleaning spray guns (solvents and thinners). Paint booth filters may also be hazardous depending on what's in the paint (such as chromium, nickel, or lead). Other wastes to consider are absorbents used to soak up leaks or spills, shop rags, and aerosol cans. If you have questions please contact the NMED Hazardous Waste Bureau at 505-827-1511.

WASTEWATER REGULATIONS:

There is nothing unique in wood finishing shops that isn't already covered in the General Regulatory Guidelines.

OSHA REGULATIONS:

Attached to this briefing paper is a document entitled "Woodworking Shops" that can assist you in being compliant with OSHA.

UNDERGROUND STORAGE TANK REGULATIONS:

There is nothing unique in wood finishing shops that isn't already covered in the General Regulatory Guidelines.

SOLID WASTE REGULATIONS:

There is nothing unique in wood finishing shops that isn't already covered in the General Regulatory Guidelines.

Pollution Prevention and Regulatory Compliance Contacts for New Mexico

STATE AGENCIES:

Green Zia Environmental Excellence Program

Dave Wunker
NM Environment Department
Office of the Secretary
PO Box 26110
Santa Fe, NM 87502
505-827-0677
FAX: 505-827-2836
E-mail:
dave_wunker@nmenv.state.nm.us

Air Quality Bureau

Steve Dubyk
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-1294
FAX: 505-827-0045
E-mail:
steve_dubyk@nmenv.state.nm.us

Hazardous Waste Bureau

Debby Brinkerhoff
NM Environment Department
2044 Galisteo
P.O. Box 26110
Santa Fe, NM 87502
505-827-2528
FAX: 505-827-1833
E-mail:
debby_brinkerhoff@nmenv.state.nm.us

Occupational Health & Safety Bureau

Kevin Koch
525 Camino de los Marquez, Suite 3
P.O. Box 26110
Santa Fe, NM 87502
505-827-4230
FAX: 505-827-4422
E-mail:
kevin_koch@nmenv.state.nm.us

Ground Water Quality Bureau

Maura Hanning
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2945
FAX: 505-827-2965

Solid Waste Bureau

E. Gifford Stack
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2853
FAX: 505-827-2902
E-mail:
Gifford_stack@nmenv.state.nm.us

Underground Storage Tank Bureau

Joyce Shearer, Ph.D.
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-476-3779
FAX: 505-827-0310
E-mail:
joyce_shearer@nmenv.state.nm.us

City of Albuquerque

Public Works Department

Bob Hogrefe
Southside Water Reclamation Plant
4210 Second Street, SW
Albuquerque, NM 87185
Ph: 873-7030
Fx: 873-7087
Rhogrefe@cabq.gov

Environmental Health Department

John Liberatore
EHD/APCD
P.O. Box 1293
Albuquerque, NM 87103
505-768-1964
FAX: 505-768-2617
E-mail: jliberatore@CABQ.gov

New Mexico State University

Chris Campbell
WERC P2 Center
1155 University Blvd., SE
Albuquerque, NM 87106
505-843-4251
E-mail: chrisc@werc.net

State of New Mexico Wastewater Treatment Facility Contacts

POTW FACILITY	PHONE NO.	CONTACT PERSON
ALAMOGORDO, CITY OF	(505)439-5643 (505) 437-4530	Jose Miramontes
ALBUQUERQUE, CITY OF	(505)873-7040	Charles Bowman, WW Utilities Div. Director
ANTHONY W & SD	(505)882-3922	Pat Banegas
ARTESIA, CITY OF	(505)746-2122	Ernest Thompson, Mayor
AZTEC, CITY OF	(505)334-8664	Gary Spickelmier
BELEN, CITY OF	(505)864-6081	Robert Rimorin
BERNALILLO, TOWN OF	(505)867-2307	Nick Tobey
BLOOMFIELD, CITY OF	(505)632-8474	Casimiro Ruybalid
CANNON AIR FORCE BASE		Lynn Steinle
CAPITAN, VILLAGE OF	(505)354-2247	Terry Cox
CARLSBAD, CITY OF	(505)887-5412	Gilbert Ybarbo
CARRIZOZO, TOWN OF	(505)354-2247	Steve Sale
CHAMA, VILLAGE OF	(505)756-2184	Tony Gonzales, Mayor
CIMARRON, VILLAGE OF	(505)376-2232	Lino Paiz
CLAYTON, TOWN OF		
CLOUDCROFT, VILLAGE OF	(505)682-2411	David Venable, Mayor
CLOVIS, CITY OF	(505)769-7865	Robert Challender
CONCHAS STATE PARK	(505)868-2900	Leo Wilson
CUBA, VILLAGE OF	(505)289-3864	Faustino Gallegos
DEMING, CITY OF	(505)546-8848	Louis Jenkins, Public Works Director
DEPARTMENT OF ENERGY, LANL AND U OF CA	(505)665-7855	Charles Barnett
DES MOINES, VILLAGE OF		
DEXTER, TOWN OF	(505)734-5482	Joe Alvarez
EAGLE NEST, VILLAGE OF		
ECO Resources #3	(505)891-1223	Donald Thymes
ECO Resources # 2	(505)891-1223	Donald Thymes
ESPANOLA, CITY OF	(505)753-4740	Frank Naranjo
ESTANCIA, TOWN OF	(505)384-2302	
EUNICE, CITY OF	(505)394-2576	Willie Luster
FARMINGTON, CITY OF	(505)599-1315	Tom Wethington, WW Director
FORT SUMNER, VILLAGE OF	(505)355-2401	John McMillan, Mayor
GALLUP, CITY OF	(505)863-1210	Ray Espinoza
GRANTS, CITY OF	(505)287-7927	Willie Alire, City Manger
HAGERMAN, TOWN OF	(505)752-3201	Robert Romero
HATCH, VILLAGE OF	(505)267-3021	Clifford Browning
HOBBS, CITY OF	(505)397-9315	James Tulk
HOLLOMAN AIR FORCE BASE	(505)479-7080	Meryle F. Stueve, TSgt, USAF

JAL, CITY OF	(505)395-2222	Fred Seifts
JEMEZ SPRINGS, CITY OF	(505)829-3540	David Sanchez, Mayor
KIRTLAND AIR FORCE BASE HQ AFSWC/CC		
LAGUNA, PUEBLO OF		Frank Analla
LAS CRUCES, CITY OF	(505)528-3599	Gilbert Morales
LAS VEGAS, CITY OF	(505)454-1401	Andrew R. Jaramillo
LOGAN, VILLAGE OF	(505)487-2239	Julian Cordova
LORDSBURG, CITY OF	(505)524-8273	Alex De La Garza
LOS ALAMOS, BAYO PLANT	(505)662-8147	Paul Pizzoli, Utilities Director
LOS LUNAS, VILLAGE OF	(505)865-9689	Louis Huning, Mayor
LOVING, VILLAGE OF		
LOVINGTON, CITY OF	(505)396-2884	Bob Carter
MAGDALENA, VILLAGE OF	(505)854-2261	Vida M. Trujillo
MAXWELL, VILLAGE OF	(505)375-2752	Leroy Quintana, Mayor
MELROSE, VILLAGE OF	(505)253-4274	Bobby Bennett, Mayor
MORA MUTUAL DOMESTIC WATER & SEWER. WKS.	(505)387-5401	Manuel B. Alcon President
MORIARTY, CITY OF	(505)832-6257	Rosendo Saiz
MOUNTAINAIR, TOWN OF	(505)847-2321	Debra Kelly
ORGAN WATER AND SEWER ASSOCIATION	(503)825-5423	Charles Jefferson
PECOS, VILLAGE OF	(505)757-6591	Joseph Cyde Baca, Mayor
PORTALES, CITY OF	(505)359-3152	Thomas Howell
QUESTA, VILLAGE OF	(505)586-0694	Mike Cordova
RAMAH DOMESTIC UTILITIES	(505)722-4366	Ron Morsbach
RATON, CITY OF	(505)445-2292	Mike Baca
RED RIVER, TOWN OF	(505)754-2277	Jake Pierce, City Administrator
RESERVE, VILLAGE OF	(505)533-6581	Lonnie Graham
		Roger Cooper, PE, Dir of Public Works
ROSWELL, CITY OF	(505)624-6700	
ROY, VILLAGE OF	(505)485-2204	Alex Deschamps
RUIDOSO-RUIDOSO DOWNS REGIONAL WWTP	(505)258-4014	Gary Jackson, Village Manager
SAN JON, VILLAGE OF	(505)576-2922	Chris Molyneaux
SANTA FE, CITY OF	(505)984-6509	Qustandi Kassisieh
		Gerald Anaya, Water & Sewer Superintendent
SANTA ROSA, CITY OF	(505)472-3331	
SANTA TERESA SERVICES COMPANY	(505)589-0906	Charles Crowder
SILVER CITY, TOWN OF	(505)388-4981	Stan Snider
SOCORRO, CITY OF	(505)835-0240	Pat Salome, City Clerk
SPRINGER, TOWN OF		
SUNLAND PARK, CITY OF	(505)589-1979	Mark Boling
TAOS, TOWN OF	(505)758-8401	Mark Swan, Supervisor
TATUM, TOWN OF	(505)392-7412	F. L. (Roy) Miller
TEXICO, TOWN OF	(505)482-3314	Mathew Meeks

THOREAU WATER AND SANITATION	(505)862-7136	Vidal Brown
TRUTH OR CONSEQUENCES, CITY OF	(505)894-7331	Quentin Drunzer, City Manager
TUCUMCARI, CITY OF	(505)461-3451	Bernadette Moya, City Manager
TULAROSA, VILLAGE OF	(505)585-2771	Margaret Gonzales, Village Clerk
TWINING, W & SD	(505)776-8845	Joe Harvey
VAUGHN, TOWN OF	(505)392-1266	F.L. Miller - Con. Engineer
WAGON MOUND, VILLAGE OF	(505)666-2408	Alfred Romero Mayor

INITIAL NOTIFICATION REPORT

Applicable Rule: 40 CFR 63, Subpart JJ - National Emission Standards for Wood Furniture Manufacturing Operations

Notification reports are due to EPA Region 6 by September 3, 1996.

1. Print or type the following information for each plant in which Wood Furniture Manufacturing Operations are performed:

Owner/Operator/Title _____

Street Address _____ Quad ____ Phone (____)

City _____ State _____ Zip Code _____

Plant Name _____ Phone (____)

Plant Contact/Title _____

Plant Street Address (if different than above) _____

Quad _____

City _____ State _____ Zip _____

Code _____

2. Briefly describe the wood furniture manufacturing process used at your facility:
3. Estimate of annual use of coatings, adhesives, cleaning, and washoff materials:

_____gallons

4.
 - a. If #3 is less than 3000 gallons, then you may be exempt from this regulation. This form, along with materials usage recordkeeping can serve as the required documentation of your exemption.

Exempt

- b. If #3 is more than 3000 gallons, please indicate (x) your anticipated compliance approach for meeting the requirements of this regulation:

Compliant Coatings _____ Averaging _____

Control Device _____ Combination _____

INITIAL NOTIFICATION REPORT (continued)

5. Certification by responsible official.

A Responsible Official can be:

- * The President, Vice-President, Secretary, or Treasurer of the Company that owns the Plant
 - * The Owner of the Plant
 - * The Plant Engineer or Supervisor
- * A Government Official if the Plant is owned by the Federal, State, City , or County Government; or
 - * A ranking military officer if the Plant is located on a military base

I, the undersigned, certify the information contained in this report to be accurate and true to the best of my knowledge.

(Signature of Responsible Official)

(Date)

(Print or Type Name)

(Title)

6. Mail this form to:

NMED Air Quality Bureau
Small Business Assistance Program
PO Box 26110
Santa Fe, New Mexico 87502

If you have any questions filling out this form, please contact the Small Business Assistance Program (SBAP) at 1-800-810-7227.

State of New Mexico
ENVIRONMENT DEPARTMENT
Harold Runnels Building
1190 St. Francis Drive, P.O. Drawer 26110
Santa Fe, New Mexico 87502-0110

GARY E. JOHNSON
Governor

MARK E. WEIDLER
Secretary

To: Wood Furniture Manufacturers

March 1996

On December 7, 1995, the United States Environmental Protection Agency (USEPA) finalized a regulation which limits emissions of hazardous air pollutants (HAPs) from wood furniture manufacturing operations. These HAPs are regulated because they have the potential to cause health problems. The USEPA estimates that with this regulation Americans will reduce toxic air emissions by 33,000 tons annually. Of the HAPs listed by USEPA; toluene, xylene, methanol, methyl ethyl ketone, methyl isobutyl ketone and formaldehyde are the most commonly used chemicals in wood surface coating and gluing operations.

The new regulation:

- ◆ Applies to many new and existing manufacturers of wood furniture or wood furniture components. See the other side of this page to determine if the regulation applies to your business.
- ◆ **Allows exemptions.** Small manufacturers using less than 250 gallons per month or less than 3000 gallons per rolling 12 month period of all of finishing materials, adhesives, cleaning solvents, and wash-off solvents combined, can be exempted from this regulation, if they can document their materials usage. In order to begin documenting any exemption, please complete the enclosed "Initial Notification Report Form" and send it back to the Small Business Assistance Program (SBAP). We are constructing a list of exempted wood furniture manufacturers and will be informing the Environment Department Air Quality Bureau Enforcement Section and the USEPA of your exemption status. Enclosed is a "Monthly Recordkeeping Worksheet" and a "Rolling 12 Month Recordkeeping Worksheet" that will help you maintain the necessary records to help your business document any eligible exemptions. Along with monthly recordkeeping, your business should maintain all purchase receipts of finishing materials, adhesives and solvents.
- ◆ Requires all wood furniture manufacturers which are not exempt to send an "Initial Notification Report Form" to EPA Region 6 by **September 3, 1996**. Additional reporting and work practice requirements also apply. A copy of the initial notification report form is enclosed. Please send the form to the SBAP by September 3, 1996 and we will fax it to EPA.

This informational package has been assembled by the SBAP, of the New Mexico Environment Department Air Quality Bureau, to help businesses comply with this new regulation. The primary purpose of the SBAP is to assist small businesses which are or will be subject to requirements under the Clean Air Act or New Mexico Air Quality Regulations. The goal of the SBAP is to help businesses comply with federal and state air quality regulations through education and technical assistance, not enforcement. Services are free. Please see the enclosed brochure. If you have any questions or would like to use our services please contact the SBAP at 1-800-810-7227.

40 CFR Part 60
Subpart JJ - National Emissions Standards for
Wood Furniture Manufacturing Operations

I. Who does this new regulation apply to?

This regulation applies to businesses operating under any of the following standard industrial classification codes.

SIC	Description
2434	Wood Kitchen Cabinets (Includes Vanities, Bathroom & Other)
2511	Wood Household Furniture, Not Upholstered (Includes Garden)
2512	Wood Household Furniture, Upholstered
2517	Wood TV, Radio, Phono, and Sewing Machine Cabinets
2519	Household Furniture Not Elsewhere Classified (Includes Willow, Wicker, Reed)
2521	Wood Office Furniture
2531	Public Building and Related Furniture
2541	Wood Office and Store Fixtures, Partitions, Shelving, and Lockers
2599	Furniture and Fixtures, Not Elsewhere Classified
5712	Furniture Stores Manufacturing Custom Cabinets

II. What is required?

- A. The following businesses are required to submit an initial notification report form (enclosed) to USEPA Region 6 by September 3, 1996 in accordance with 40 CFR § 63.806:
1. Businesses using more than 250 gallons per month, for every month, or more than 3000 gallons per rolling 12 month period of finishing materials, adhesives, cleaning solvents, and wash-off solvents combined; **and**
 2. Businesses using more than 5 tons of a single HAP or more than 12.5 tons of HAPs combined per rolling 12 month period.
- B. For businesses meeting the criteria in A 1. or A 2., air permitting, reporting, and work practice standards requirements will also apply.
- C. For those businesses that are smaller than those described in A 1. or A 2., records of monthly material usage must be kept for five years.

Note: You may be able to reduce HAP emissions, while maintaining current production, with the use of pollution prevention techniques or by using compliant coatings. Such prevention options may also help your business reduce its materials usage costs. Please contact the Small Business Assistance Program at 1-800-810-7227 (in Bernalillo County call 505-768-1964) if you would like to use our services or receive more information.

November 15, 1995

FACT SHEET

FINAL AIR TOXICS REGULATION FOR WOOD FURNITURE MANUFACTURING OPERATIONS

TODAY'S ACTION...

- ◆ The Environmental Protection Agency (EPA) is today issuing a final rule to reduce air toxics emissions from wood furniture manufacturing operations. Wood furniture manufacturing facilities, including cabinet shops and residential and industrial furniture makers, emit air toxics during finishing, gluing, and cleaning operations.
- ◆ The EPA final rule is the result of successful partnerships among major stakeholders; the rule was developed largely through a regulatory negotiation with representatives from the furniture manufacturing industry (including small business), the coatings industry, environmental groups, and State and local air pollution agencies.
- ◆ The final regulation demonstrates the EPA commitment to making pollution prevention an integral part of regulatory actions whenever possible; the control requirements outlined in the rule are based solely on pollution prevention options instead of end-of-pipe controls.

WHAT ARE THE HEALTH AND ENVIRONMENTAL BENEFITS?

- ◆ The EPA final rule will reduce emissions of air toxics, such as toluene, xylene, methanol, and formaldehyde, by 33,000 tons annually, representing a 60 percent reduction from current levels. Exposure to these and other air toxics associated with wood furniture manufacturing can cause adverse health effects, including eye, nose, throat, and skin irritation; damage to the heart, liver, and kidneys; and reproductive effects.

BACKGROUND

- ◆ Under the Clean Air Act (CAA) Amendments of 1990, the EPA is required to regulate emissions of 189 listed toxic air pollutants. On July 16, 1992, the EPA published a list of source categories that emit one or more of these air toxics. For listed categories of "major" sources (those that emit or have the potential to emit 10 tons/year or more of a listed pollutant, or 25 tons or more of a combination of pollutants), the CAA requires the EPA to develop standards that will require the application of very stringent controls known as maximum achievable control technology.

- ◆ On July 16, 1992, the EPA published a list of industry groups (known as "source categories") to be regulated, which included major sources of wood furniture manufacturing operations.

WHO WILL BE AFFECTED BY THE FINAL REGULATION?

- ◆ The EPA final rule applies to about 750 wood furniture manufacturing facilities nationwide.

WHAT ARE THE MAIN COMPONENTS OF THE EPA FINAL RULE?

- ◆ The EPA final rule is based on two requirements--emissions limits and work practice standards. The final rule provides flexibility to industry by offering a choice of four different compliance options.
- ◆ The final rule limits the amount of hazardous air pollutants (HAP) that can be contained in the coatings used for finishing, gluing, and cleaning operations. The emissions limits can be met through using a variety of coatings that contain lower quantities of HAP.
- ◆ The work practice standards will reduce waste and evaporation of HAP. Good housekeeping measures such as keeping containers of materials closed, periodic training of operators who use solvent and/or coatings, and performing periodic inspections to locate and repair leaking equipment are required by the work practice provisions. In addition, the rule requires use of spray equipment which is believed to be more efficient in applying coatings. The work practice standards also require accounting for the quantity of solvent used for cleaning and washoff, the number of times each piece of equipment is washed off, and the reason for the washoff. These practices will focus attention on quality control issues that will result in the minimization of HAP and volatile organic compound emissions.
- ◆ The EPA's final rule outlines the monitoring, recordkeeping, and reporting requirements.

HOW MUCH WILL THE RULE COST?

- ◆ The total industry-wide capital investment is estimated to be \$7.0 million. The total nationwide annual cost is estimated to be about \$15 million.

FOR MORE INFORMATION...

Anyone with a computer and a modem can download the rule from the CAA Amendments bulletin board of the EPA electronic Technology Transfer Network by calling (919) 541-5742 (look under "Recently Signed Rules"). For further information about how to access the board, call (919) 541-5384. For further information about the rule, contact Paul Almodovar of the EPA Office of Air Quality Planning and Standards at (919) 541-0283.

Pollution Prevention in Wood Finishing: Solvent

Eliminate - Reduce - Reuse - Recycle -
Exchange

Quality vs.

An

In the wood furniture finishing industry, the largest source of environmental pollution and risk to workers' health is the **evaporation of organic solvents** used throughout the finishing process.

Due to the common use of spray techniques with low (~ 25%) transfer efficiency and flash drying techniques, almost 100% of the toxic solvents used to apply the coating chemicals evaporate into the surroundings. Furthermore, toxic particles resulting from over-spray and contaminated rags are often regulated as RCRA waste and must be disposed of properly, which is a **costly process**.

The **quality and market value** of a piece of furniture is directly tied to the finished surface and look. Higher quality pieces must undergo a greater number of coatings and subsequent drying processes in order to achieve a desired finish. This leads to greater volumes of solvent vapors and over-spray particles.



It is important to remember when considering the opportunity for pollution prevention, that it is the finished product that determines the piece's worth, not the procedure used to attain that product. In evaluating a process change, do not dismiss an idea that has not been used in the past. **Pollution prevention** within the wood finishing industry often involves changing the processes. This fact-sheet is meant to provide a resource on the hazards associated with solvents commonly employed in wood finishing processes, as well as a guideline for **pollution prevention opportunities** and technologies currently employed and available to the industry.

Sol

The top 10 solvents released into the atmosphere during various wood furniture finishing processes, in order of release volume, are **toluene, methanol, xylene, methyl ethyl ketone, acetone, N-butyl alcohol, 1,1,1-trichloroethane (TCE), and dichloroethane**. Most of these chemicals are volatile organic compounds (VOC's), highly flammable, and pose significant **human health risks**.

- Toluene is an aromatic, petroleum-based solvent that upon environmental release volatilizes in the lower atmosphere, reacting with other atmospheric components and sunlight to form ground-level ozone, the main

component of smog and other air pollutants. Human inhalation or ingestion of toluene can result in headaches, weakness, memory loss, and may also affect kidney and liver functions.

- Methanol, a highly flammable alcohol, is readily absorbed by human gastrointestinal and respiratory tracts, where it is converted to formaldehyde and formic acid, making it toxic even in moderate doses. High doses can damage the central nervous system and cause blindness. Prolonged exposure can cause liver and blood damage. Environmentally, methanol evaporates into the atmosphere and reacts to form formaldehyde, contributing to the formation of various air pollutants and rain contamination.
- Xylene contributes to ground-level ozone formation and groundwater contamination due to its moderate soil



mobility. The human body rapidly absorbs xylene through skin contact, inhalation or ingestion. High-level, short-term exposure can cause skin, eye, nose, and throat irritation as well as impaired lung and memory function and potential changes in the liver and kidneys. Both long-term prolonged exposure and short-term high-level exposure can cause headaches, dizziness, and loss of muscle coordination.

- Methyl Ethyl Ketone (MEK) is a flammable liquid that after even moderate exposure can cause symptoms ranging from headaches, dizziness, and nausea to numbness in the fingers and nose and eventually unconsciousness. Repeated moderate to high-level exposure may damage the liver or kidneys. Vapors are irritating to the nose, skin, and throat, and may cause damage to the eyes. MEK released to the environment will evaporate into the lower atmosphere where it contributes to the formation of air pollutants.
- Acetone is both a volatile and flammable organic compound. In the lower atmosphere it can contribute to ozone formation. It is also irritating to the eyes, nose, and throat, and in large quantities can cause headaches, unsteadiness, drowsiness, vomiting, and respiratory depression.
- 1,1,1-trichloroethane (TCE), which degrades slowly in the lower atmosphere, can return to earth via rain. Once introduced into groundwater and soil it degrades very slowly, contaminating resources. Repeated contact with TCE may cause serious skin cracking and infection, as well as eye and respiratory irritation. High concentrations cause reversible liver and kidney dysfunction, central nervous system and respiratory depression, stupor, coma, and death. Lower concentration levels produce light-headedness, impaired coordination, drowsiness, convulsions, and throat irritation.

Pollution Prevention

When examining the opportunities to **reduce waste**, it is important to identify to needs and requirements of the target market. For mass-produced, lower-end furniture, such as some office and home furniture, there are several processes that utilize water-borne or hybrid water-borne coatings, which greatly reduce solvent vapors, though they make it harder to repair irregularities in the coating. If it is determined that all coatings are necessary to produce the desired appearance, there are still many **pollution prevention** and **cost reduction opportunities** which are possible.

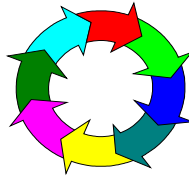
- Operational Improvements:

- ✓ Make production planning and scheduling changes. For example, identify blemishes before adding coatings.
- ✓ Reduce the frequency of equipment cleaning to reduce the amount of solvent needed. Stain all products of one color at a time, or designating a certain spray configuration to a prevalent color. Schedule the production line so lighter batches are stained before progressively darker colors.

- Increased Transfer Efficiency:

Transfer efficiency is the percentage of coating particles that adhere to the furniture surface. In coating procedures such as brushing, wiping, rolling, and dipping, this efficiency is nearly 100%. These processes are fairly uncommon because they are labor and capital intensive. High-pressure spraying techniques are more common but less transfer efficient. There are several technologies available which can increase the transfer efficiency while still affording the ease of the spray gun system.

- ✓ Use airless and air-assisted airless systems. These nearly double the transfer efficiency.
- ✓ Explore the use of electrostatic spray systems, which spray negatively charged coatings at the positively charged wood.
- ✓ Try high-volume low pressure spray systems (HVLP), which have higher transfer efficiencies than even the airless systems and increase the accuracy and speed.



- Alternative to the Spray Process:

- ✓ Use ultraviolet (UV) - curable coatings that can be configured to add color or raise grain. However, only use this for non-flat pieces.

- Increasing Exhaust Filtration Capacity:

- ✓ Retrofit a filtration device to existing spray booths in order to increase the capture of solvent vapors.
- ✓ Use a biofiltration system made from organic matter. This system "digests" the organic solvent vapors and makes them harmless.
- ✓ Reuse or clean paper or plastic filters.

- Increase Commitment to Pollution Prevention

- ✓ Develop a policy a post it in a prominent location. Involve employees and hold training sessions.
- ✓ Give employees incentives for good pollution prevention ideas.

- ✓ Organize a reference manual for staff that explains waste reduction and management procedures.
- ✓ Use inventory control to save money on duplicate purchases and to screen hazardous waste.
- ✓ Reuse and recycle everything you can. Provide clearly labeled bins and implement incentive programs.

Pollution Prevention can Save You Money and